Final Environmental Assessment
for
AQM-37 Operations at the
National Aeronautics and Space Administration
Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, Virginia 23337

June 20, 2003

PREFACE

This *Environmental Assessment for AQM-37 Operations at the National Aeronautics and Space Administration Goddard Space Flight Center's Wallops Flight Facility* has been developed by EG&G Technical Services (EG&G) for the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center's (GSFC) Wallops Flight Facility (WFF).

This report was prepared by EG&G for the exclusive use of WFF. This report was performed in accordance with NASA Procedures and Guidelines (NPG) 8580.1, *Implementing The National Environmental Policy Act and Executive Order 12114* (Reference 1).

ENVIRONMENTAL ASSESSMENT FOR AQM-37 OPERATIONS AT THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION GODDARD SPACE FLIGHT CENTER WALLOPS FLIGHT FACILITY, WALLOPS ISLAND, VIRGINIA 23337

Lead Agency: National Aeronautics and Space Administration
Goddard Space Flight Center's Wallops Flight Facility

Proposed Action: Operations of the AQM-37 Targets
Goddard Space Flight Center's Wallops Flight Facility

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Date: June 20, 2003

EXECUTIVE SUMMARY

The National Aeronautics and Space Administration (NASA) Goddard Space Flight Center's (GSFC) Wallops Flight Facility (WFF) is proposing to make available for use the air launched drone target, AQM-37, at Wallops Island, Virginia. The AQM-37 would be used as a target for missile exercises conducted by the U.S. Navy and supported by WFF in the Virginia Capes Operating Area (VACAPES OPAREA). The target would be used to test the performance of shipboard weapons systems as well as provide simulated real-world targets for ship defense training exercises. This would allow naval personnel to qualify to military standards for ship defense, and train for national defense. It is the intent of this document, consistent with the National Environmental Policy Act (NEPA), to provide information on the environmental impacts of AQM-37 operations at WFF.

The purpose of using the AQM-37 as a simulated target is to provide a low-cost, more realistic threat simulation option for testing ship defense interceptor systems as well as providing a training target for operational units. Target tests are needed to validate system design performance and operational effectiveness of new and existing operational ship interceptor targets and sensor systems in order to counter both current and future threats. The threat cannot be completely represented by a single target system. It requires a mix of various targets with different physical, electromagnetic, and flight characteristics. The AQM-37 would provide a unique threat profile that cannot be duplicated with other targets.

The proposed action includes:

- receipt and storage of the AQM-37 target in the WFF Explosives Storage Area (M-Area);
- final assembly of targets in the M-Area;
- transportation of targets to and from the loading area on the WFF airfield hot pad;
- loading and unloading targets onto a military aircraft at the airfield hot pad;
- range management;
- target launch and flight operations;
- target destruction and debris impact in the VACAPES OPAREA; or
- target disassembly, packaging, and return shipping to Target Systems Department, Naval Air Warfare Center, Weapons Division, (NAWCWPNS), California.

The potential requirement for target flights would be an average of 20 flights per year (maximum of 30). The first flight would occur as early as July 2003, and continue for at least 10 years or until the target system is replaced. This document will be reevaulated either after 10 years (i.e., 2013) or if a change in mission occurs.

Methodology

The purpose of this Environmental Assessment (EA) is to analyze the potential environmental consequences of the proposed action in compliance with NEPA, the Council on Environmental Quality (CEQ) regulations implementing NEPA, and the NASA Procedures and Guidelines (NPG) 8580.1*, Implementing The National Environmental Policy Act and Executive Order 12114* (Reference 1).

Fourteen environmental attributes were evaluated in this EA to provide an understanding of the potential to be affected by the proposed activity. These attributes provide a baseline for understanding the potential effects of the proposed action and a basis for assessing the significance of the potential impacts in the NEPA process. The attributes selected were:

- land resources
- water resources
- air quality
- noise
- hazardous materials and waste
- biological resources
- population
- recreation
- employment and income
- health and safety
- cultural resources
- environmental justice
- transportation
- cummulative effects

To assess the significance of potential impacts, the description of activities required to accomplish the proposed action was defined and the affected environment was described. The impact of the proposed activity on the environment at the proposed location was analyzed to determine its significance. If a proposed activity was determined to have a potential for causing significant environmental impact, it was analyzed in greater detail in terms of intensity, extent, and context.

Several of the attributes are regulated by federal or state environmental statutes. The standards defined in the statutes provide a benchmark to assist in determining the significance of the environmental impact. The compliance status of each attribute with respect to the applicable statute was included in the information collected on the affected environmental attribute.

Summary of Environmental Analysis

The consequences for each environmental attribute at the proposed locations were assessed. Table ES-1 summarizes the environmental impacts of the proposed activity.

Conclusions

The analysis of the 14 environmental attributes indicated that there were no significant environmental effects from the AQM-37 operations at WFF, which could not be mitigated by operational procedures. The activities proposed at WFF Main Base and VACAPES OPAREA fall within the range of activities defined in the approved *Environmental Resources Document NASA Goddard Space Flight Center's Wallops Flight Facility, Wallops Island, Virginia 23337* (Reference 2) and the *Final Environmental Assessment for Range Operation Expansions at the NASA Goddard Space Flight Center's Wallops Flight Facility, Wallops Island, Virginia 23337* (Reference 3), which covers flight launch operations. The potential for cumulative environmental impacts because of the AQM-37 mission at WFF was insignificant. The ground support operations and aircraft flight operations at WFF alter the existing level of activity by less than 1.0 percent each year. The AQM-37 activities at WFF Main Base and the VACAPES OPAREA would alter the level of range activities to the same degree.

Table ES-1 Summary of Potential Environmental Impacts

Environmental Attribute	No-Action	Proposed Action
Land Resources	No impacts	Insignificiant impact due to minor possibility of surface soil contamination in the event of an aircraft mishap.
Water Resources	No impacts	Slight increase after monolithic impact due to the small amount of fuel, oxidizer and battery residues onboard the AQM-37. When target is destroyed during flight, no hazardous waste should reach the ocean. Consistent with the Virginia Coastal Resources Management Plan.
Air Quality	No impacts	Insignificant impact due to minor increase in vehicle and aircraft operations.
Noise	No impacts	Insignificant impact due to minor increase in number of aircraft takeoff and landings. Minor impact associated with the sonic boom from the targets flight.
Hazardous Materials and Waste	No impacts	No impact during normal operations. If there is an accidental spill or release of AQM-37 fuel or oxidizer, then hazardous waste would be generated.
Biological Resources	No impacts	No impact during normal operation. No significant impact to any other Threatened or Endangered species. WFF is not required to submit an application for the incidental take of marine mammals since the level of impact from WFF activities does not warrant a Letter of Authorization.
Population	No impacts	No impacts anticipated during normal operations.
Recreation	No impacts	Public Affairs Office would meet with tournament organizers, fishing clubs, and county officials prior to AQM-37 launch operations. U.S. Coast Guard would issue a Notice to Mariners and the Federal Aviation Administration would issue a Notice to Airmen.
Employment and Income	No impacts	No impacts
Health and Safety	No impacts	Slight increase due to the storage, assembly, loading, and possible disassembly of the AQM-37 targets.
Cultural Resources	No impacts	No impacts
Environmental Justice	No impacts	No impacts
Transportation	No impacts	No significant impacts. U.S. Coast Guard would issue a Notice to Mariners and the Federal Aviation Administration would issue a Notice to Airmen.
Cumulative Effects	No impacts	No impacts since oceanic mixing and dilution would occur more rapidly than target disintegration.

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LIST OF ACRONYMS AND ABBREVIATIONS

3D/ESI	3D/Environmental Services, Inc.
ACGIH	American Conference of Governmental Industrial Hygienists
ALOHA	Areal Locations of Hazardous Atmospheres
AOA	Airport Operating Area
APHIS	Animal and Plant Health Inspection Service
C	Celsius
CAS No.	Chemical Abstract System Number
CBPA	Chesapeake Bay Preservation Area
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CL	Ceiling Limits
COE	U.S. Army Corps of Engineers
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dB, dBA	Decibels
DETA	Diethylene triamine
DEQ	Department of Environmental Quality
DOT	Department of Transportation
EA	Environmental Assessment
EG&G	EG&G Technical Services
EJIP	Environmental Justice Implementation Plan
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
EO	Executive Order
ERD	Environmental Resource Document
ER-L	Effects Range-Low Value
ESA	Endangered Species Act
F	Fahrenheit
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
GHz	Gigahertz
GSFC	Goddard Space Flight Center

ICP	Integrated Contingency Plan
IDLH	Immediately Dangerous to Life or Health
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IRFNA	Inhibited Red Fuming Nitric Acid
HAZCOM	Hazard Communication
HAZWOPPER	Hazardous Waste and Emergency Response Training
hrs	Hours
kHz	Kilohertz
ksc	Kilograms per square centimeter
kV	Kilovolt
kW	Kilowatt
Leq	Time average sound energy level
M-Area	Explosives Storage Area
MAF-4	Mixed Amine Fuel
MBTA	Migratory Bird Treaty Act
MHz	Megahertz
mg/L	Milligrams per liter
mg/m^3	Milligrams per cubic meter
min	Minutes
MMPA	Marine Mammal Protection Act
mph	Miles per hour
MPRSA	Marine Protection, Research, and Sanctuaries Act
MRFSS	Marine Recreational Fishery Statistics Survey
MSDS	Material Safety Data Sheets
NAAQS	National Ambient Air Quality Standards
NACA	National Advisory Committee for Aeronautics
NASA	National Aeronautics and Space Administration
NAWCWPNS	Naval Air Warfare Center Weapons Division, Target Systems Department
NAWQC	National Ambient Water Quality Criteria
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NEW	Net Explosive Weight
NIOSH	National Institute for Occupational Safety and Health
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOTAM	Notice to Airmen
NOTMAR	Notice to Mariners
NPG	NASA Procedures and Guidelines

OB/OD	Open Burn / Open Detonation
OSHA	Occupational Safety and Health Administration
OSPL	Overall Sound Pressure Level
OSD	Operations and Safety Directive
PEL	Permissible Exposure Limit
ppm	Parts per million
ppt	Parts per thousand
psi	Pounds per square inch
RF	Radio Frequency
RfR	Radio Frequency Radiation
RMA	Resource Management Area
RPA	Resource Protection Area
STEL	Short-Term Exposure Limit
TBT	Tributylin
TSDF	Treatment, Storage, and Disposal Facility
TWA	Time Weighted Average
UHF	Ultra High Frequency
UDMH	Unsymmetrical dimethylhydrazine
USDA	U.S. Department of Agriculture
USC	United States Code
VAC	Virginia Administrative Code
VACAPES OPAREA	Virginia Capes Operating Area
VCP	Virginia Coastal Resources Management Program
VOCs	Volatile Organic Compounds
VPDES	Virginia Pollution Discharge Elimination System
WFF	Wallops Flight Facility
wk	Week
WS	Wildlife Service

1.0 PURPOSE AND NEED

1.1 PURPOSE

The National Aeronautics and Space Administration (NASA) Goddard Space Flight Center's (GSFC) Wallops Flight Facility (WFF) is proposing to make available for use the air launched drone target, AQM-37, at Wallops Island, Virginia. The AQM-37 would be used as a target for missile exercises conducted by the U.S. Navy and supported by WFF in the Virginia Capes Operating Area (VACAPES OPAREA). The target would be used to test the performance of shipboard combat systems, as well as to provide simulated real-world targets for ship defense training exercises. The Target Systems Department, Naval Air Warfare Center, Weapons Division, (NAWCWPNS), California, along with the Program Executive Office, Cruise Missiles and Unmanned Vehicles would provide the AQM-37 target missile. It is the intent of this document, consistent with the National Environmental Policy Act (NEPA), to provide information on the environmental impacts of AQM-37 operations at WFF and the VACAPES OPAREA.

The AQM-37 would be shipped overland in accordance with Department of Transportation (DOT) standards and regulations. The target would be transported in a fueled state to WFF where it would be stored in the Explosives Storage Area (M-Area). The target would be shipped and stored in four containers: target body, wing and canard, battery, and vertical stabilizers. Since the target would be shipped fully fueled, there would be no target fueling operations at WFF. The target would be removed from the shipping containers and assembled in the M-Area. It would then be transported, on an approved route, to the WFF airfield hot pad, where it would be mounted on a military aircraft.

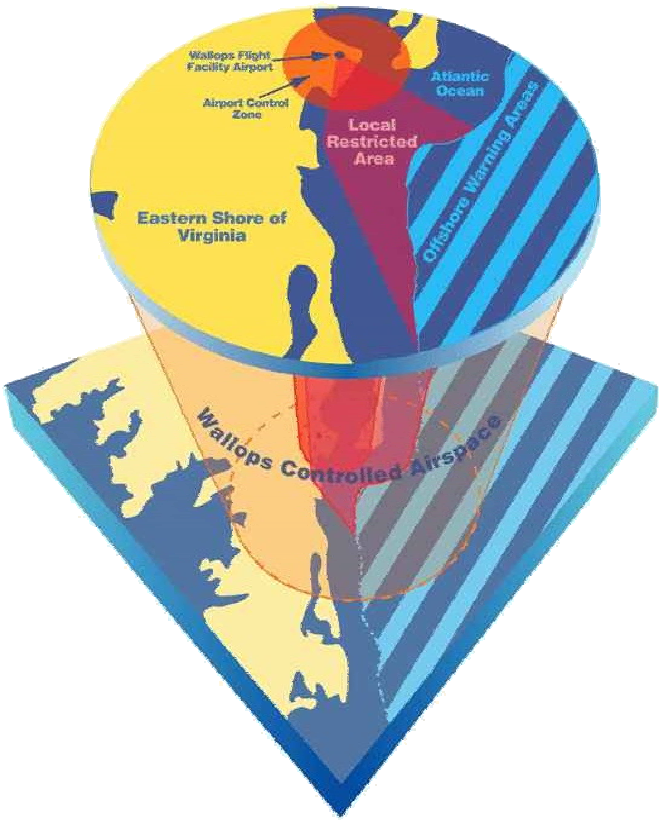


Figure 1-1 Controlled Airspace Around WFF

The military aircraft for this operation would depart from Kirtland Air Force Base, New Mexico. The launch aircraft would arrive at WFF and two targets would be loaded, one under each wing of the aircraft. After departing WFF, the aircraft would fly through the WFF airport controlled airspace (see Figure 1-1) to the launch point, and launch one of the targets in the adjoining VACAPES OPAREA controlled airspace. The VACAPES OPAREA is a surface and

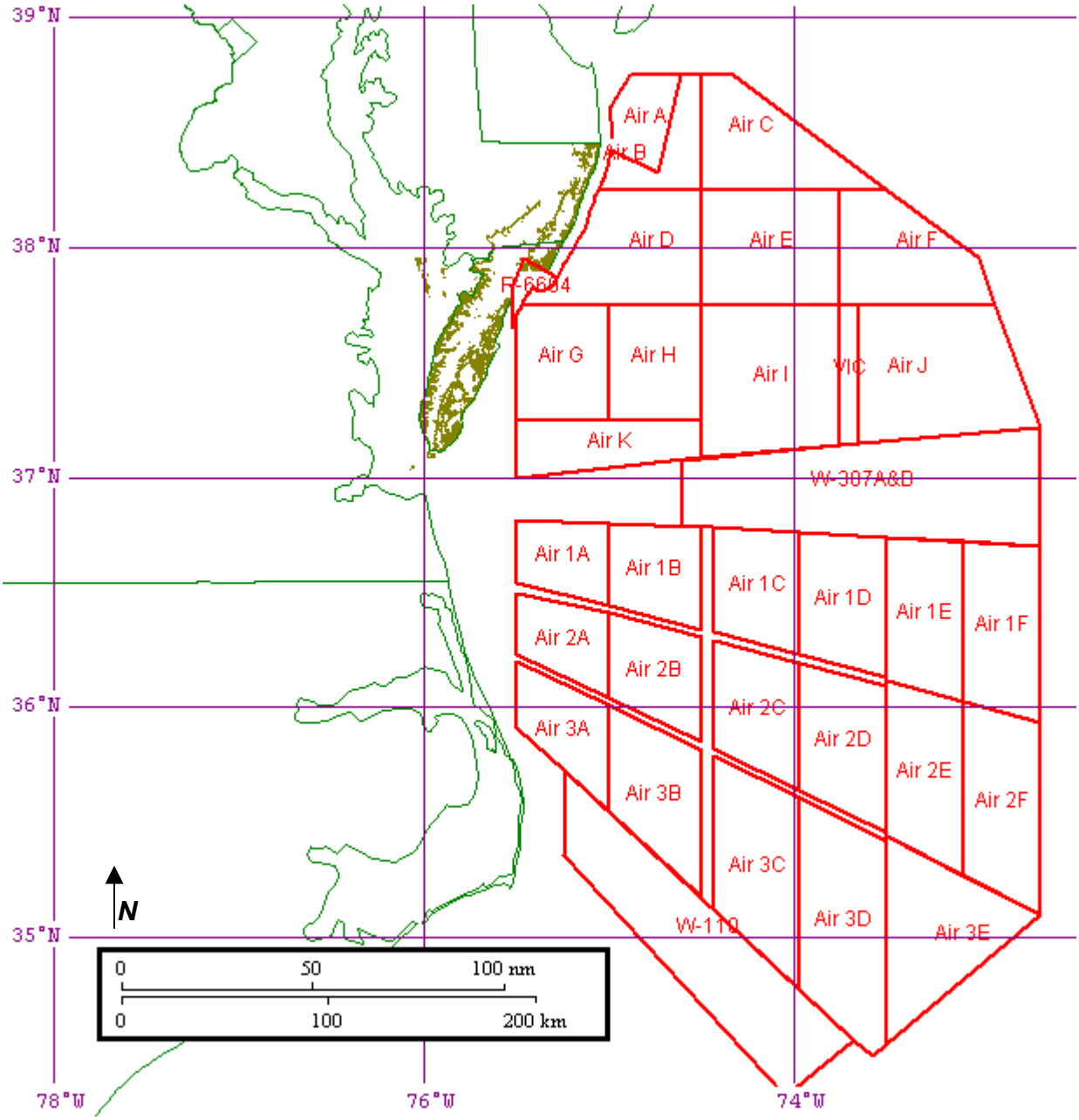


Figure 1-2 VACAPES OPAREA

subsurface military operating area off the Virginia and North Carolina coasts. It includes the area covered by aircraft warning areas Air A through W-110 and the Submarine Transit Lanes (see Figure 1-2). The VACAPES OPAREA is used for various surface, subsurface, and air-to-surface exercises. Historically, military aircraft operating over international waters off the U.S. East Coast have utilized separate airspace. These designated warning areas have been set aside to ensure that military operations do not conflict with other air traffic moving along airways outside the warning area.

Following launch, the target would fly its programmed trajectory. Shipboard interceptor missiles would engage and intercept the target over the VACAPES OPAREA. All debris from the intercept would fall within the VACAPES OPAREA boundaries. The aircraft would return to WFF and the remaining target would be off-loaded for storage.

The potential requirement for target flights would be an average of 20 flights per year (maximum of 30). The first flight would occur as early as July 2003, and continue for at least 10 years or until the target system is replaced. This document will be reevaulated either after 10 years (i.e., 2013) or if a change in mission occurs.

1.2 BACKGROUND

Wallops Flight Facility is located in the northeastern portion of Accomack County, Virginia, on the Delmarva Peninsula. Wallops Flight Facility is comprised of the Main Base, Mainland, and Wallops Island. The Main Base includes the airfield, most administrative buildings, and some research facilities.

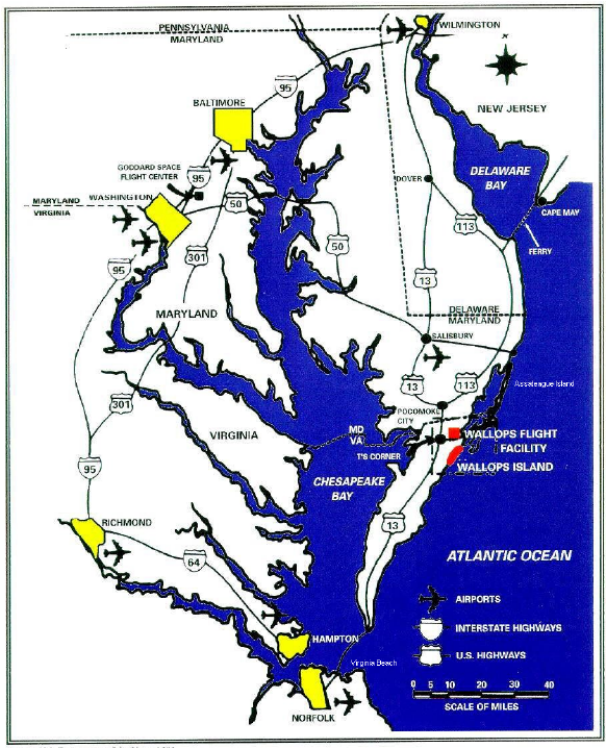


Figure 1-3 Location of Wallops Flight Facility

The Main Base is located off Virginia Route 175, approximately 3.2 kilometers (2 miles) east of U.S. Route 13 (Figure 1-3). The entrance gate for the Mainland and Wallops Island is approximately 11 kilometers (7 miles) south of the Main Base

Figure 1-4 Aerial View of the Main Base

The Mainland facilities include radar, antennas, and transmitter systems and associated buildings (Figure 1-4). Wallops Island includes the rocket launch range and the U.S. Navy's AEGIS and Ship Self Defense System Facilities (Figure 1-5).

Wallops Flight Facility provides resources and expertise to the aerospace, scientific, and technology communities. The WFF uses its research airfield, fixed and mobile launch range, and orbital tracking facilities to provide cost-effective and quick response flight opportunities and data collection.

Figure 1-5 Aerial View of Navy AEGIS and Wallops Island

The project management, design and fabrication capabilities, research and testing abilities, and operations expertise of the WFF workforce and its partners (i.e. the National Oceanic and Atmospheric Administration (NOAA), the U.S. Navy Surface Combat Systems Center, and the Virginia Space Flight Center), enable NASA, other government agencies, and industry to meet prescribed objectives. These objectives include supporting the development of new technologies to increase the capabilities of launch platforms.

1.3 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

This Environmental Assessment (EA) describes and addresses the potential environmental impacts associated with AQM-37 operations at WFF. Additionally, this EA summarizes impacts from the alternatives considered, as well as the laws and regulations which apply.

The potential requirement for target flights would be an average of 20 flights per year (maximum of 30). The first flight would occur as early as July 2003, and continue for at least 10 years or until the target system is replaced. This document will be reevaulated either after 10 years (i.e., 2013) or if a change in mission occurs.

Up to 30 combined takeoff and landing operations (average of 20) each year would involve:

- the receipt, storage, assembly, pre-flight testing, transportation to the loading pad, and loading the air launched drone target, AQM-37 onto a military aircraft at the WFF;
- aircraft flight from the WFF airfield to the launch point off Wallops Island;
- launch of the target, target flight, and impact of target (monolithic or debris after destruction) in the VACAPES OPAREA; and
- return of the aircraft to the WFF airfield, unloading of unused targets, and return of targets to storage.

Pursuant to NEPA of 1969 (Title 42 of the United States Code (USC) Section 4321 *et seq.*), the President's Council on Environmental Quality (CEQ) NEPA

regulations (Title 40 of the Code of Federal Regulations (CFR) Sections 1500-1508), and consistent with NASA Procedures and Guidelines 8580.1, *Implementing the National Environmental Policy Act and Executive Order 12114* (Reference 1), the scope of this EA is determined by the range of impacts associated with the proposed action and alternatives. The objective of the EA is to provide sufficient analysis to determine whether an Environmental Impact Statement (EIS) or a Finding Of No Significant Impact (FONSI) is appropriate for this action. This document will be reevaulated either after 10 years (i.e., 2013) or if a change in mission occurs.

The alternative actions considered, including potential impacts, are summarized in Chapter 2.0. The affected environment is discussed in Chapter 3.0. Much of the information for Chapter 3.0 was provided by the 1999 *Environmental Resources Document NASA Goddard Space Flight Center's Wallops Flight Facility, Wallops Island, Virginia 23337* (ERD) for WFF prepared by Occu-Health, Incorporated (Reference 2). Chapter 4.0 assesses the potential environmental consequences of performing the proposed action and alternatives, and identifies mitigation measures that would lessen any significant impacts. Chapters 3.0 and 4.0 are divided into the following resource areas: physical resources such as land resources, water resources, air quality, noise, and hazardous materials and hazardous waste; biological resources including vegetation, terrestrial wildlife and migratory birds, threatened and endangered species and marine mammals; social and economic resources, and cumulative effects. Chapter 5 is the list of preparers, reviewers, and technical editors. Chapter 6 is the list of agencies, organizations, and persons to whom this document has been sent. Chapter 7 is the list of references used in this EA. Appendix A contains the Material Safety Data Sheets (MSDS) for Inhibited Red Fuming Nitric Acid (IRFNA) and Mixed Amine Fuel (MAF-4).

1.4 RELATED ENVIRONMENTAL DOCUMENTATION

Other aerial targets may be used during the planned missile exercises conducted by WFF. The environmental impacts from these targets have already been analyzed and recorded in other environmental documentation; they are not analyzed in this document. However, they would be incorporated by reference. These documents include:

- *Environmental Resources Document NASA Goddard Space Flight Center's Wallops Flight Facility, Wallops Island, Virginia 23337*. 1999. (Reference 2);
- *Final Environmental Assessment for Range Operation Expansions at the NASA Goddard Space Flight Center's Wallops Flight Facility, Wallops Island, Virginia 23337*. 1997. (Reference 3); and
- *Final Supplemental Environmental Impact Statement for Sounding Rocket Program NASA Goddard Space Flight Center's Wallops Flight Facility, Wallops Island, Virginia 23337*. 1998. (Reference 4).

1.5 PERMITS, LICENSES, AND ENTITLEMENTS

None are required.

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 PROPOSED ACTION

This chapter describes the proposed actions at WFF. Interceptor target operations are not analyzed in this document but are covered in documents relating to the specific ship's system. The "No Action" alternative is also discussed.

The proposed action includes:

- receipt and storage of the AQM-37 target in the M-Area,
- final assembly of target in the M-Area,
- transportation of target to and from the WFF airfield hot pad,
- loading and unloading target onto and from the military aircraft,
- aircraft flight operations,
- target launch and flight operations, and
- target destruction and debris impact in the VACAPES OPAREA; or
- target disassembly, packaging, and return shipping to NAWCWPNS.

The activities of the ship launched interceptor have been analyzed in separate environmental documents (Reference 5). Potential environmental impacts of other targets launched from the WFF launch range have also been analyzed in separate documents (Reference 3). Neither the activities of the ship launched interceptor nor potential environmental impacts of other targets launched from the WFF launch range will be further discussed in this document.

The AQM-37 is an air launched, preprogrammed, nonrecoverable target with external command and control capabilities which can be used as an aerial target to test new and operational ship defense weapon systems. The assembled target is approximately 4.3 meters (14 feet) long and 0.3 meters (13 inches) in diameter, with a wing span of 1 meters (3.3 feet). The target weighs 281 kilograms (620 pounds) when flight-ready. The target incorporates a UHF receiver/decoder for command and control and a telemetry transmitter for target performance data. Figure 2-1 shows the physical dimensions of the AQM-37 target. There have been over 1,000 flights of the U.S. Navy AQM-37C model, worldwide since 1982. The current manufacturer, Raytheon Aircraft Corporation, has had a reliability rate of 97 percent of the targets used since 1994 (Reference 6) and has delivered over 5,000 AQM-37 units to the U.S. Navy since 1962.

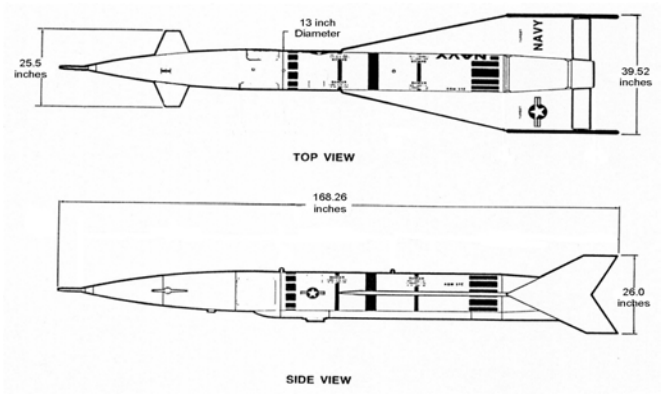


Figure 2-1 AQM-37 Dimensions

The pre-fueled target has a self-contained hypergolic propellant system consisting of MAF-4 and IRFNA as an oxidizer (Table 2-1). During final assembly at WFF, the target is pressurized to 232 ± 3.5 kilograms per square centimeter (ksc) (3,300 ± 50 pounds per square inch (psi))

with nitrogen gas. Upon launch, the pressurized gas forces the oxidizer and the fuel into the thrusters. Each target has a Net Explosive Weight (NEW) of 13 kilograms (29 pounds) (Reference 6).

Table 2-1 AQM-37 Propellant Data

Name	Total kg (lbs)	Minium Residual kg (lbs)	Maximum Residual kg (lbs)
MAF-4	32.1 (70.8)	0.8 (1.7)	10.2 (22.5)
IRFNA	95.8 (211.3)	2.4 (5.3)	30.6 (67.5)

2.1.1 WFF Ground Support Activities.

An annual maximum of 30 targets would be delivered from NAWCWPNS to WFF by surface transportation to accommodate the target requirements of ship defensive weapon systems testing and training requirements. The targets would be shipped in individual metal storage containers. Component parts, including wing kits, vertical stabilizers, payload kits, and battery kits, would be stored in an explosives bunker in the M-Area until they are needed for target assembly and testing. In preparation for a launch, typically two targets (primary and back-up), which are partially assembled and pre-fueled, are transferred into the assembly building by fork-lift. Inside the building, the components would be removed, by hoist, from their containers. Batteries would be activated and electronics would be checked. Wings, vertical stabilizers, canards, cartridge activated devices, payload kits, and batteries would be installed. Once the targets are assembled, they would be tested and loaded on munitions trailers, one target per trailer and moved outside. The targets would then be pressurized to 232 ± 3.5 ksi (3,300 ± 50 psi) with nitrogen and transported to aircraft loading area or brought back into the building for short-term storage. The targets may be stored in the M-Area overnight until the following day's mission. Once assembly is completed, vehicular transport must be minimized due to the sensitive nature of the propellant system. The nitrogen pressurization remains effective for 72 hours, after which the system starts to depressurize. Trained and qualified ordnance personnel from the U. S. Navy AQM-37 Integrated Program Team from NAWCWPNS would conduct final target assembly in the M-Area. These personnel would be at the WFF area approximately 2 weeks for each mission.

Targets would be transported from the storage/assembly area to the loading area at the hot pad, via the approved munitions route shown in Figure 2-2:

- south from the explosive storage area on Reeder Boulevard
- east on runway 10-28
- northwest on runway 17-35 to the airfield hot pad.

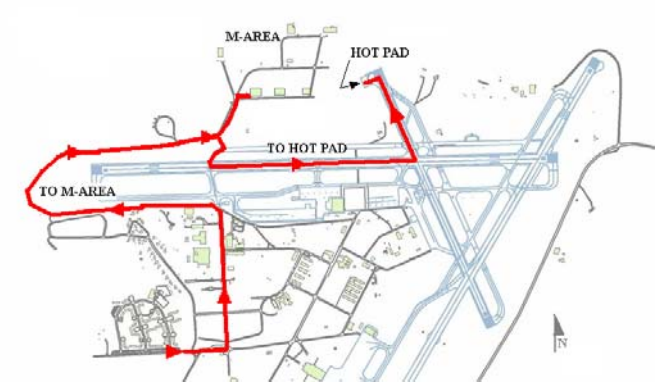


Figure 2-2 Transportation Routes

Targets would be offloaded from the munitions trailers using a boom adapter hooked to the fork attachment of a bomb loader. The targets would be loaded up to an installed pylon and LAU-24 Launch Adapter on a military aircraft. The

aircraft/target electronics would receive a preflight checkout. The aircraft may carry two targets. The aircraft would taxi to the departure end of the runway where the final checklist would be completed and the arming pins removed.

Unused targets would be removed from the aircraft, transported to the assembly area, depressurized, disassembled, repacked in the original DOT shipping container, and shipped, overland, back to NAWCWPNS. The entire process of target assembly, launch, and return of unused targets would normally take about 2 weeks.

2.1.2 Aircraft Flight Operations

The military aircraft would take-off from the WFF airport in an approved flight plan that would avoid overflight of populated areas. The aircraft would fly through WFF airport controlled airspace to the launch point in the adjoining VACAPES OPAREA controlled airspace where the target would be launched from the aircraft. Refer to Figure 1-2 for details of the WFF controlled airspace. After target launch the aircraft would return to WFF, land, and any unused targets removed. If any in-flight emergencies occur, the target would be jettisoned over the ocean and into the VACAPES OPAREA.

There would be a slight overall increase in aircraft operations at the WFF airport due to AQM-37 operations. Up to 20 targets may be used in spring and fall training exercises. An additional 10 targets could be used, annually, as targets for newer ship's defensive weapon systems testing. Therefore, a maximum of 30 additional departures and landings, annually, are possible, though fewer are anticipated.

2.1.3 Target Flight Operations

The AQM-37 target would be air-launched from the military aircraft and travels on a preprogrammed flight path. The AQM-37 would be under active command and control during the flight. The target is capable of being launched from the aircraft at altitudes between 300 and 18,000 meters (1,000 and 60,000 feet) and at speeds between 835 to 2,150 kilometers per hour (Mach 0.7 to 1.8). The target would be launched within the boundaries of the VACAPES OPAREA. Figure 2-4 depicts a typical target launch.

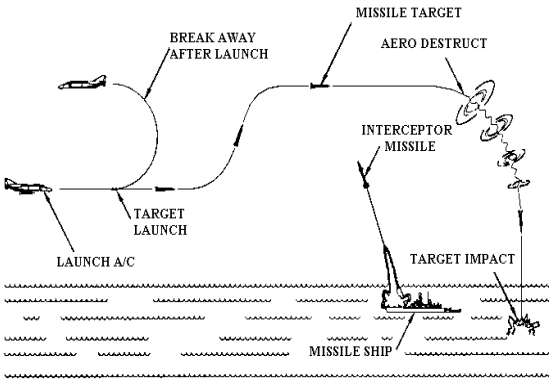


Figure 2-3 Typical Target Launch and Flight Intercept Profile

Launch profile (altitude, aircraft velocity at launch, and launch location) would be selected such that the target would not impact outside the VACAPES OPAREA boundaries. The WFF Safety Office would reviewed the AQM-37 trajectory profiles, the potential malfunctions, and the resultant vehicle impact dispersions. The Safety Office would perform flight safety analyses to assess the risks associated with each profile and define risk mitigation measures and operational flight safety limits to ensure that vehicle debris impacts would be contained in the VACAPES OPAREA. The U.S. Coast Guard would issue a Notice to Mariners (NOTMAR) for each of the hazard areas. The areas would also be surveyed

and confirmed clear of ship and air traffic prior to launch. Moreover, the Federal Aviation Administration (FAA) would issue a Notice to Airmen (NOTAM) and activate the special use airspace in the VACAPES OPAREA. The resultant risk to mission essential and non-participants would be negligible.

The AQM-37 would be remotely controlled from the ground. The on-board control system would be overridden and the target steered to ensure all impact scenarios would be contained in clear areas. If in the extreme case, the target fails to respond, the WFF Flight Safety Officer would activate the destruct command based on flight termination limits, once again ensuring that the vehicle impacts would be contained in clear areas.

During normal flight operations, the target may be intercepted by the ship's defense system interceptor missile or as a track only target for a target acquisition system (i.e., radars, lasers, etc.). Target/missile intercepts would result in debris falling into the VACAPES OPAREA. If the AQM-37 is used as a tracking target, it would be either preprogrammed to impact in the designated impact area or the destruct command would be used.

2.1.4 Flight Termination and Debris Scatter

Since the launch point and flight pattern of the target, engagement geometry of the interceptor and target, and time and date of the test would vary, a detailed analytical analysis of the debris-impact range and scatter pattern cannot be included in this EA. Conducting a detailed mission-hazards analysis to quantify the risks associated with the test is one of the most important aspects in preparation of a target flight. The Safety Office at WFF requires that a detailed safety analysis of each test be prepared and submitted for review and approval as a part of the pretest documentation. Safety and Environmental personnel at WFF would analyze the documentation to ensure that risks to personnel, the public, and environmental resources are minimized.

2.1.4.1 Aerodynamic Termination

All AQM-37 targets are equipped with an aerodynamic destruct, flight termination device. The aileron linkage is separated from the actuator by a small explosive cartridge, allowing a spring to drive the ailerons to their physical limit (about 30 degrees) in a left-roll direction. The AQM-37 then enters a continuous, rapid left roll, nulling the lift force, and follows a ballistic trajectory descent. If the rocket motor is burning at the time the destruct command is given, thrust is terminated due to propellant starvation of the motor. Rapidly-changing acceleration would displace the propellant inside the tanks causing loss of thrust. The ensuing deceleration usually maintains propellant towards the forward part of the tanks, preventing engine restart. The distance traveled downrange is primarily a function of the target's speed and altitude at the time the destruct command is initiated. Based upon historic performance, the AQM-37 is most likely to impact the surface slightly left of its course. At the initiation of destruct, the target translates its angle of attack into sideslip, creating a nose-left movement that influences its overall trajectory during descent.

2.1.4.2 Explosive Termination

Explosive termination would occur when a defensive missile intercepts the AQM-37 over the VACAPES OPAREA. There are several sources of energy during the target's destruction/fragmentation event. The first is the energy released by the kinetic impact or explosive charge of the interceptor's warhead. The second source of energy is the release of the pressurized gas, up to 232 ksc (3,300 psi), used to maintain propellant pressure in the engine. The final source of energy results from the explosive reaction of the remaining hypergolic propellants. These energy sources would cause the target to break in many fragments.

The distribution of fragment weights would not be uniform. The electronic equipment and engine (located at the ends of the target) would remain intact and account for most of the mass in the debris cloud. When the impact or defensive target's explosive charge rupture the fuel tanks, aerodynamic forces would rip apart the fuselage propellant section causing the fuel tanks and other internal systems to break up into a limited number of smaller fragments. The wings and vertical stabilizer may not break apart but would detach from the fuselage.

Analysis of similar destruction/ fragmentation events indicate that the target would break into over 100 fragments. However, less than 10 of the fragments would have sufficient size to be harmful to humans or biological resources in the debris impact area. The propellants onboard the AQM-37 at the time of destruction would be either consumed in the explosion (hypergolic reaction) or dispersed in the atmosphere. No propellants would reach the ocean in any significant concentration. Typical flight profiles of the AQM-37 show that the target would have a velocity greater than 900 meters per second (Mach 3) and would be destroyed at altitudes between 4 kilometers (13,000 feet) and 30 kilometers (100,000 feet). The greater the altitude at the time of destruction, the larger the debris dispersion pattern would be (Reference 6).

A portion of the falling debris from the target breakup presents an impact hazard to exposed personnel and biological resources on the ground or at sea. Fragment lethality can be defined by the kinetic energy of the fragments on impact. The kinetic energy is proportional to the mass and velocity of the falling object. According to a study conducted at Sandia National Laboratories (Reference 5), a person struck by a fragment with a mass between 0.02 and 3.0 kilograms (0.04 and 6.63 pounds) and 79 joules of kinetic energy would have a 10 percent chance of being killed and a 90 percent chance of sustaining serious injury. The study recommended that for all flight-test range safety analyses an impact kinetic energy level of 15 joules be used as the kinetic energy level below which the fragments are considered to be no longer hazardous.

2.1.4.3 Aircraft Mishap

Controllers and pilots would endeavor to avoid populated areas below aircraft flight paths. A mishap of the aircraft that is carrying the AQM-37 could occur either upon takeoff, transport, or landing. A mishap could result in either fire, explosion, or the aircraft or the target burying itself in the ground. If a fire or explosion results, the majority of both aircraft and target fuels would be consumed. If the target is embedded in the ground, the impact area would not be entered for 24 hours after impact. Delaying access time would allow

the residual fuel and oxidizer to degrade and dissipate. Due to their nature, the propellants would evaporate quickly and would breakdown from the effects of oxidization and sunlight. As a safety precaution, the first personnel to enter the area would monitor the MAF-4 and IRFNA concentrations and determine when it is safe to begin recovery and cleanup operations. The levels of MAF-4 and IRFNA would be continuously monitored throughout the entire process. Personnel should wear protective clothing. Debris pieces in the immediate vicinity of the crater would be placed in the crater and covered with a thin layer of dirt. The crater would be left open for 6 months to aid in the dissipation of the fuel and oxidizer. After 6 months, the crater would then be backfilled. Soil which was forced out of the ground during impact would be used to fill the hole. Debris recovery for the aircraft and the AQM-37 would be conducted by experienced personnel.

2.2 DESCRIPTION OF OTHER ALTERNATIVES

2.2.1 No Action Alternative

The No Action alternative considered is the continuation of currently used targets at WFF. The ground support activities would not occur and the estimated 30 additional aircraft take-offs and landings would not occur. The No Action alternative would not decrease the number of target/interceptor operations but would only restrict flexibility in the selection of a low-cost, more realistic threat simulation option for testing ship defense interceptor systems as well as providing a training target for operational units. In order to counter both current and future threats, ship's defense system tests are needed to validate design performance and operational effectiveness of interceptor sensors and missiles.

The ship's threat cannot be completely represented by only one target system. It requires a mix of various targets with different physical traits, radar cross section, and flight characteristics. The AQM-37 would provide one additional target option for current and future ship defense interceptor systems.

This No Action alternative would not reduce the environmental impact of ship defense system interceptor system testing and in some cases would increase the impact since other target systems (e.g., LANCE, Storm, etc.) are larger and are ground launched (Reference 3).

2.2.2 Other Alternatives

There are no other reasonable alternatives. The use of other targets is not an alternative (as they do not meet the velocity and altitude requirements) and is defined as such in the No Action alternative. The AQM-37 is an air launched target; therefore, the use of aircraft is required. Changing the location of the ground support activities and type of aircraft does not appreciably alter the activities or environmental consequences, and is, therefore, not a reasonable alternative.

2.3 SUMMARY

Table 2-2 summarizes the anticipated environmental impacts of AQM-37 ground support activities and flight operations. The assessment of potential impacts is based on guidance from the CEQ (40 CFR 1508.27), which specify that significance should be

determined in relationship to both context and intensity (severity).

The primary, initial environmental concerns appear to be limited to the impacts of accidents concerning spills, fires, or explosions involving AQM-37 propellants during ground support activities. There are no off-site consequences, since under the scenario the target, once launched, would be able to glide to an impact point in the VACAPES OPAREA.

Table 2-2. Summary of Potential Environmental Impacts

Environmental Attribute	No-Action Alternative	Proposed Action
Land Resources	No impacts	Insignificiant impact due to minor possibility of surface soil contamination in the event of an aircraft mishap.
Water Resources	No impacts	Slight increase after monolithic impact due to the small amount of fuel, oxidizer and battery residues onboard the AQM-37. When target is destroyed during flight, no hazardous waste should reach the ocean. Consistent with the Virginia Coastal Resources Management Plan.
Air Quality	No impacts	Insignificant impact due to minor increase in vehicle and aircraft operations.
Noise	No impacts	Insignificant impact due to minor increase in number of aircraft takeoff and landings. Minor impact associated with the sonic boom from the targets flight.
Hazardous Materials and Waste	No impacts	No impact during normal operations. If there is an accidental spill or release of AQM-37 fuel or oxidizer, then hazardous waste would be generated.
Biological Resources	No impacts	No impact during normal operation. No significant impact to any other Threatened or Endangered species. WFF is not required to submit an application for the incidental take of marine mammals since the level of impact from WFF activities does not warrant a Letter of Authorization.
Population	No impacts	No impacts anticipated during normal operations.
Recreation	No impacts	Public Affairs Office would meet with tournament organizers, fishing clubs, and

Environmental Attribute	No-Action Alternative	Proposed Action
		county officials prior to AQM-37 launch operations. U.S. Coast Guard would issue a Notice to Mariners and the Federal Aviation Administration would issue a Notice to Airmen.
Employment and Income	No impacts	No impacts.
Health and Safety	No impacts	Slight increase due to the storage, assembly, loading, and possible disassembly of the AQM-37 targets.
Cultural Resources	No impacts	No impacts.
Environmental Justice	No impacts	No impacts.
Transportation	No impacts	No significant impacts. U.S. Coast Guard would issue a Notice to Mariners and the Federal Aviation Administration would issue a Notice to Airmen.
Cumulative Effects	No impacts	No impacts since oceanic mixing and dilution would occur more rapidly than target disintegration.

3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

Wallops Flight Facility is a multifaceted research and development center with particular expertise in launching and utilizing aeronautical systems. Used for aeronautics research since 1945, WFF maintains three runways, an active launch range, communications and radar tracking systems, and 556 buildings or structures on approximately 26.3 square kilometers (6,500 acres).

This section provides information with respect to the existing environmental resources on or in the vicinity of WFF that may be affected by the proposed action. Environmental conditions at WFF have been discussed in detail in the following documents:

- *Environmental Resources Document NASA Goddard Space Flight Center's Wallops Flight Facility, Wallops Island, Virginia 23337*. 1999. (Reference 2);
- *Final Environmental Assessment for Range Operation Expansions at the NASA Goddard Space Flight Center's Wallops Flight Facility, Wallops Island, Virginia 23337*. 1997. (Reference 3);
- *Final Supplemental Environmental Impact Statement for Sounding Rocket Program NASA Goddard Space Flight Center's Wallops Flight Facility, Wallops Island, Virginia 23337*. 1998. (Reference 4).

Based upon the assessment, it was determined that there is a potential for the following resources to be affected: physical, biological, socioeconomic, and cumulative effects.

3.2 PHYSICAL ENVIRONMENT

3.2.1 Land Resources

3.2.1.1 Topography and Drainage

The topography of WFF is typical of the Mid-Atlantic coastal region, which is mostly flat without unusual features. The maximum elevation on the Main Base is approximately 12.2 meters (40 feet) above mean sea level. The runway area resembles a plateau since it is extremely flat and at a higher elevation than most of the Main Base. The plateau effect from the runway area diminishes as the topography approaches the waterways (Reference 2).

3.2.1.2 Geology and Soil

Located within the Atlantic Coastal Plain physiographic province, WFF is underlain by approximately 2,000 meters (7,000 feet) of sediment. This sediment lies atop crystalline basement rock. The sedimentary section, ranging in age from Cretaceous to Quaternary, consists of a thick sequence of terrestrial, continental deposits overlain by a much thinner sequence of marine sediments. These sediments are generally unconsolidated and consist of clay, silt, sand, and gravel. The regional dip of the units is to the east, toward the shore (Reference 2).

3.2.1.3 Land Use

The Main Base, Mainland, and Wallops Island are zoned industrial by Accomack County, with one exception. The County has designated the land between Wallops Island and the Mainland as marshland.

Facilities on the Main Base include runways, hangars, offices, and housing. The Mainland facilities include radar, antennas, and transmitter systems and associated buildings. Wallops Island has testing facilities, launch facilities, storage buildings, and office buildings. Activities and studies undertaken at WFF include rocket launches, radar testing, radar tracking, and aircraft testing. Please refer to Chapter 4.0 of the 1999 ERD for further information (Reference 2).

Primarily agricultural land areas and single family, residential housing surround WFF. Please refer to Chapter 4.0 of the 1999 ERD for further information (Reference 2).

3.2.1.4 VACAPES OPAREA Substrate

The VACAPES OPAREA lies with the Mid-Atlantic Bight with Baltimore Canyon bounding the north and Washington Canyon Bounding the south. The depth of water in the continental shelf at the VACAPES OPAREA averages 75 meters (246 feet). Sediment texture varies from gravel patches and a fine sand mixture inshore, to medium sand offshore extending to the shelf edge. Fine sandy silt characterizes the edge of the shelf from 200 to 400 meters (656 to 1,312 feet). The sediments in the VACAPES OPAREA are typical of the offshore to shelf-edge area, consisting of fine quartz sand with a patchy veneer of shells (Reference 8).

3.2.2 Water Resources

Surface waters in the vicinity of WFF are saline to brackish and have tidal influences due to the coastal location. The surface waters in the vicinity of WFF are designated as Class II (Estuarine Waters) by the Commonwealth of Virginia's Department of Environmental Quality (DEQ). The Atlantic Ocean, which lies to the east of Wallops Island, is designated as Class I (Open Ocean). These classifications include water quality standards for dissolved oxygen, pH, and maximum temperature. In addition, numerical water quality standards are applied according to water classification. For Class I and II waters, the saltwater numerical standards apply. These standards are listed in the Virginia Administrative Code (VAC) regulations 9 VAC 25-31. These standards, as well as effluent limitations on point source discharges, are mechanisms used by DEQ to protect and maintain surface water quality.

Generally, sufficient data is available to characterize the existing background water quality in the vicinity of WFF. However, the tidal nature of the surrounding surface waters and the migratory nature of organisms in these ecosystems make background classification difficult. Data collected to date has been used primarily for limited site investigation purposes.

3.2.2.1 Storm Water

The DEQ, under the U.S. Environmental Protection Agency (EPA) guidelines and approval, regulates industrial point source discharges. Discharges are allowed with an approved Virginia Pollutant Discharge Elimination System (VPDES) permit and managed with WFF's Storm Water Pollution Prevention Plan (Reference 7). The WFF currently holds VPDES Permit No. VA0024457, which authorizes two discharge locations and their effluent limits (Figure 3-1). Outfalls, designated as 001 and 003, discharge into unnamed tributaries of Little Mosquito Creek. Surface water at WFF drains overland to drop inlets, ditches, and swales of the storm water system,

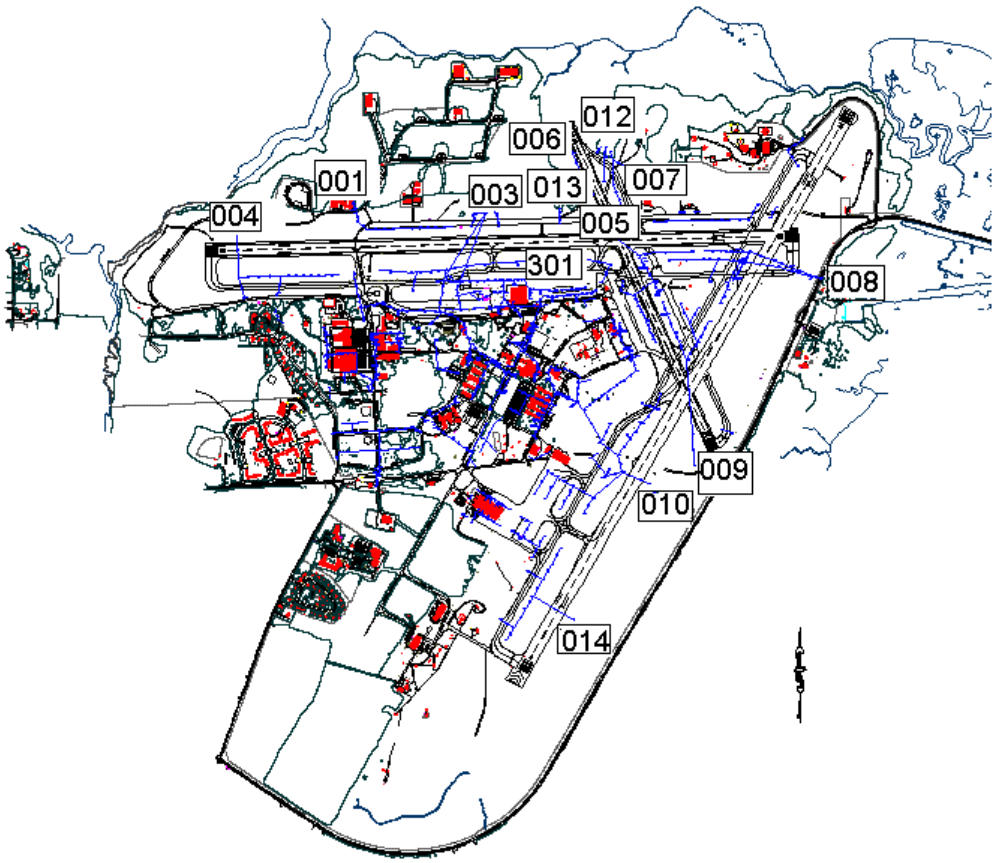


Figure 3-1 Main Base Storm Water System

finally discharging to Little Mosquito Creek. Refer to Chapter 4.0 of the 1999 ERD for further information (Reference 2).

3.2.2.2 Marine

3.2.2.2.1 Temperature and Salinity

There are distinct differences in stratification of the mid-Atlantic Ocean between summer and winter. In the winter, the water column is vertically well mixed, with water temperatures of 14° Celsius (C) (57° Fahrenheit (F)) at the

surface and 11° C (52° F) at depth. In summer (August), the water column is vertically stratified with 25° C (77° F) water near the surface and 10° C (50° F) water at depths greater than 200 meters (656 feet) (Reference 8).

Among the large rivers and estuaries that discharge fresh water into the mid-Atlantic Ocean are the Hudson River, Delaware Bay, and Chesapeake Bay. The salinity over the continental shelf ranges from 28 to 36 parts per thousand (ppt), with lower salinities found near the coast and highest salinities found near the continental shelf break. Salinities are highest in continental shelf waters during winter and lowest in the spring. Variability in this area is due to the intrusion of saltier (greater than 35 ppt) water from the continental slope waters and freshwater input from coastal sources.

Continental slope waters in the VACAPES OPAREA maintain a fairly uniform salinity range (32 to 36 ppt) throughout the year, with pockets of high salinity water (38 ppt) found near the Gulf Stream in the fall (Reference 8).

3.2.2.2.2 Circulation

The surface water masses found in the VACAPES OPAREA are the Gulf Stream, Chesapeake Bay plume water, Delaware Bay plume water, and mid-Atlantic shelf water. The Gulf Stream exerts a considerable influence on the oceanographic conditions in the VACAPES OPAREA. In general, the Gulf Stream flows roughly parallel to the coastline from the Florida Straits to Cape Hatteras, where it is deflected from the North American continent and flows northeastward past the Grand Banks. After the Gulf Stream separates from the east coast in North Carolina, the current passes approximately 175 kilometers (95 nautical miles) from the coast, through the southeastern portion of the VACAPES OPAREA. In this area, the Gulf Stream is approximately 50 kilometers (31 miles) wide and 1,000 meters (3,281 feet) deep. Surface velocity ranges from 3.7 to 9.3 kilometers per hour (2 to 5 nautical miles per hour) and temperatures from 25 to 28° C (77 to 82° F) (Reference 8).

Relatively fresh or brackish water from the Chesapeake and Delaware Bays flows out of these estuaries in the form of plume water. This less dense (due to lower salinity) water flow turns south in response to the Coriolis force, resulting in southward flowing, coastally-trapped currents. An increase in river flow and ebbing tides force more water out of the respective bays; predominant southwesterly winds cause a seaward expansion of the plume over the continental shelf, creating a well stratified, two-layer system. The warm surface waters are constantly replaced by deeper, more saline, nutrient-rich water (Reference 8).

3.2.2.3 Ground Water

The Virginia DEQ identified four major aquifers on the Eastern Shore of Virginia: the Pleistocene aquifer (Columbia Group) and the three separate units of Miocene aquifers in the Yorktown Formation (Reference 2).

The water table aquifer, known as the Pleistocene aquifer, is unconfined and typically overlain by wind-deposited beach sands, silts, and gravel. The aquifer occurs between depths of 1.5 to 18.3 meters (5 and 60 feet) below the ground surface. The water table ranges from depths of 0 to 9.1 meters (0 to 30 feet) below the ground surface. Groundwater flow is generally east and north toward nearby creeks and the marsh area that separates Chincoteague Island from the mainland (Reference 2).

The top of the shallowest confined Miocene aquifer of the Yorktown Formation at WFF is found at depths of approximately 30.5 meters (100 feet) below the ground surface. It is separated from the overlying Pleistocene aquifer by a 6.1 to 9.1 meters (20 to 30 foot) confining layer (aquitard) of clay and silt. The Miocene aquifers are classified as the upper, middle, and lower Miocene aquifers.

Each Miocene aquifer is overlain by its corresponding aquitard. Potable water supply wells for both the Town of Chincoteague and WFF are screened at the upper and middle portions of the Miocene

aquifers, from depths less than 45.7 meters (150 feet) below ground surface (Reference 2). Five in-service supply wells owned by NASA and 5 under easement to the Town of Chincoteague are screened in the EPA-designated sole source aquifer, the Columbia and Yorktown - Eastover Multiaquifer System. WFF's Chemical Laboratory, in accordance with state and federal requirements, performs routine analytical sampling of WFF's water systems and submits the results to state authorities for review.

3.2.2.4 Wetlands

Extensive marsh wetland systems border all three portions of WFF. The Main Base has tidal and non-tidal wetlands along its perimeter in association with Mosquito Creek, Jenny's Gut, Simoneaston Bay, and Simoneaston Creek. Wallops Island has non-tidal wetlands in its interior and marsh wetlands on the western edge. Marsh wetlands also fringe the Mainland along Arbuckle Creek, Hogs Creek, and Bogues Bay. Wetlands are delineated in Figures 3-2 and 3-3. Table 3-1 lists the Wetlands key and Table 3-2 is an explanation of the codes.

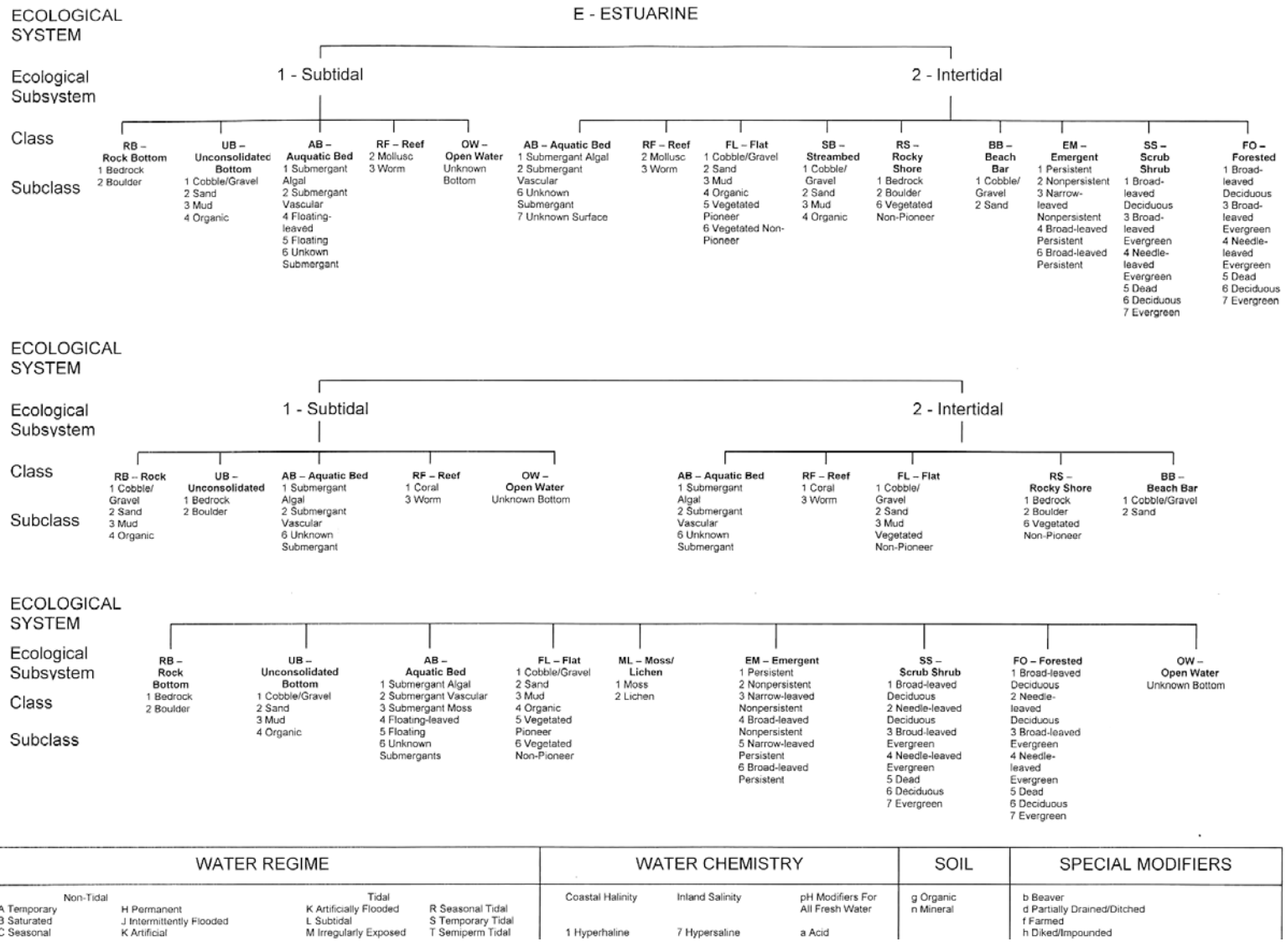
Figure 3-2 Main Base Wetlands

Figure 3-3 Wallops Island and Mainland Wetlands

Table 3-1 Wetlands Key

E2USU
E2US4N
E2US4M
E2SS4P
E2SS3P6
E2SS3P
E2SS1P
E2SS1/EM1P6
E2SS1/EM1P
E2EM1U
E2EM1P
E2EM1/SS3P
E2EM1/SS1P6
E1UBLx
E1UB4L

Table 3-2 Wetland Delineation Key



Per the Clean Water Act (CWA) (33 USC § 1251 *et seq.*), projects at WFF involving dredging or filling of tidal or nontidal waters or wetlands require Federal dredge and fill permits (Section 404 permit, and River and Harbors Act Section 10 permit) from the U.S. Army Corps of Engineers (COE). Projects involving the use or development of tidal water or wetlands also require a state wetland permit. The Accomack County Wetlands Board manages the wetlands program for both nonvegetated and vegetated tidal areas.

3.2.2.5 Floodplains

Wallops Island is entirely within the 100-year floodplain. The 100-year and 500-year floodplains surround the perimeter of the Main Base, along Mosquito Creek, Jenny's Gut, and Simoneaston Creek. On the Mainland, the 100-year and 500-year floodplains border the eastern edge along Arbuckle Creek and Hog Creek. Chapter 4.0 of the 1999 ERD (Reference 2) delineates the boundaries of the floodplains.

3.2.2.6 Coastal Zone Management

The coastal zone is rich in natural, commercial, recreational, ecological, industrial, and esthetic resources. As such, it is protected by legislation for the effective management of its resources. The Coastal Zone Management Act (CZMA) of 1972 (16 USC § 1451, *et seq*., as amended) provides assistance to states, in cooperation with federal and local agencies, for developing land and water use programs in the coastal zone. This includes the protection of natural resources and the management of coastal development.

The policy of the CZMA is implemented in the respective state coastal zone management programs. Federal lands are excluded from the jurisdiction of these state coastal zone management programs, but activities on federal lands are subject to CZMA federal consistency requirements if the federal activity would affect any land or water or natural resource of the state's coastal zone, including reasonably foreseeable effects.

The landward boundaries of the coastal zone vary by state, reflecting both the natural and built environment. The seaward boundaries generally extend to the outer limits of the jurisdiction of the state, but not more than 5.6 kilometers (3 nautical miles) into the Atlantic Ocean.

The Commonwealth of Virginia has developed and implemented a federally approved Virginia Coastal Resources Management Program (VCP) describing current coastal legislation and enforceable policies. The VCP is a networked program with several agencies administering the enforceable policies:

- Fisheries management
- Subaqueous lands management
- Wetlands management
- Dunes management
- Non-point source pollution control
- Point source pollution control
- Shoreline sanitation
- Air pollution control
- Coastal lands management

Advisory policies for geographic areas of particular concern recommended for consideration by Virginia include coastal natural resource areas, coastal natural hazard areas, and waterfront development areas.

The Virginia Chesapeake Bay Preservation Act and the Chesapeake Bay Preservation Area Designation and Management Regulations establish a cooperative program between state and local governments to reduce nonpoint source pollution. The objectives of the program are to improve water quality in Chesapeake Bay and its tributaries, and promote sound land use planning and management practices on environmentally sensitive lands, known as Chesapeake Bay Preservation Areas (CBPAs). CBPAs are classified into two categories:

- **Resource Protection Areas (RPAs),** within which development is limited to water dependent uses and redevelopment. RPAs include tidal wetlands, nontidal wetlands connected by surface flow and contiguous to tidal wetlands or perennial streams, tidal shores, and 30-meter (100-foot) vegetated buffers adjacent to these features and along both sides of perennial streams (riparian buffers).

- **Resource Management Areas (RMAs),** where development is permitted in accordance with performance criteria contained in the regulations and incorporated in local ordinances. RMAs include floodplains, highly erodible soil (including steep slopes), highly permeable soil, nontidal wetlands not included in RPAs, and any other lands the locality deems necessary to protect the quality of state waters.

3.2.3 Air Quality

3.2.3.1 Ambient Air Quality

The Ambient Air Quality Standards published by DEQ are equal to, or more stringent than National Ambient Air Quality Standards (NAAQS).

Wallops Flight Facility is located in EPA's Air Quality Control Region 4 and Administrative Region 3. The WFF is located in an attainment area for the NAAQS. The Standards are contained in 9 VAC 5-30 for the Control and Abatement of Air Pollution. Primary standards for protection of human health, and secondary standards for protection of public welfare, are included in Section 9 VAC 5-30 for criteria pollutants.

Accomack County is not designated as an Air Quality Maintenance Area in the regulations for the Control and Abatement of Air Pollution. An Air Quality Maintenance Area is defined as "any area which, due to current air quality or projected growth rate or both, may have the potential for exceeding any ambient air quality standard (for criteria pollutants) within a subsequent 10-year period" (Reference 2).

3.2.3.2 Climate and Meteorology

Wallops Flight Facility is located in the climatic region known as the humid continental warm summer climate zone. Large temperature variations during the course of a single year and lesser variations in average monthly temperatures typify the region. The climate is tempered by the proximity of the Atlantic Ocean to the east and the Chesapeake Bay to the west. Also affecting the climate is an air current, known as the Labrador Current, which originates in the polar latitudes and moves southward along the Delmarva coastline. The current creates a wedge between the warm Gulf Stream off shore and the Atlantic coast. (Reference 2).

The climate of the region is dominated in winter by polar continental air masses and in summer by tropical maritime air masses. Clashes between these two air masses create frontal systems, resulting in thunderstorms, high winds, and precipitation (Reference 2).

Temperature and precipitation in this climate zone vary seasonally. Four distinct seasons each demonstrate characteristic temperatures. In winter, sustained snowfall events are rare. Spring is wet with increasing temperatures. Summer is hot and humid with precipitation occurring primarily from thunderstorm activity. Autumn is characterized by slightly decreasing temperatures and strong frontal systems with rain and sustained winds (Reference 2).

The WFF Meteorological Office maintains climatological records for WFF.

3.2.3.3 Emission Sources

Wallops Flight Facility maintains two separate Stationary Source Permits to Modify and Operate Designated Equipment Subject to New Source Review. One permit is for the Mainland/Wallops Island and the other for the Main Base. The Mainland/ Wallops Island Permit Regulatory Number is 40909 AIRS and Identification Number 51-001-0031. The Main Base Permit Regulatory Number is 40217 AIRS and Identification Number 51-001-0005. Under this permit the WFF Main Base has annual pollutant emission limitations. These limitations, listed in Table 3-3, range from 88 tonnes (97.2 tons) per year of sulfur oxides, to 11.34 tonnes (12.5 tons) per year of particulate matter less than 10 microns in diameter (PM-10).

Table 3-3 Main Base Stationary Source Emissions

Pollutant	Permit Limit, tonnes (tons)	FY2002, tonnes (tons)
Sulfur dioxide	88 (97.2)	20.69 (22.81)
Nitrogen oxides	85.7 (94.5)	13.35 (14.72)
Particulates	12.6 (13.9)	2.68 (2.95)
PM-10	11.34 (12.5)	0.92 (1.01)
Carbon monoxide	14.2 (15.6)	2.79 (3.08)
Volatile Organic Compounds	81.4 (89.7)	0.30 (0.33)

Principal emission sources on WFF include the operation of a Central Boiler Plant and numerous individual boilers, aircraft flight operations, support activities (e.g., paint booths, fume hoods, construction, etc.); vehicular emissions; rocket and target launches; and operation of an off-specification, rocket motor Open Burn Open Detonation (OB/OD) area located at the south end of Wallops Island.

Combustion products from rocket and target launches and the OB/OD are predominantly aluminum oxide, carbon monoxide, hydrogen chloride, water, nitrogen, carbon dioxide, and hydrogen. Table 3-4 details the air quality guidelines for exposure to these emittants. The combustion of fuel and self-contained oxidizers produces emissions per National Institute for Occupational Safety and Health (NIOSH) guidelines. Under normal launch conditions, these emissions are distributed along the flight vehicle trajectory. As shown in Table 3-5, emission concentrations are greatest at ground level and decrease continuously along the flight trajectory.

Some launch vehicles are equipped with destruct systems that rupture the propellant tanks and release all remaining propellants in the event of an in-flight vehicle failure (Reference 2).

Aircraft are exempt from the DEQ regulations that govern emissions standards for mobile sources (9 VAC 5-40-5680). Aircraft operating from the WFF generally have reciprocating, turboprob, or jet engines. Most of the aircraft use JP-5 fuel. Emissions of concern are primarily hydrocarbons that disperse readily in the atmosphere, depending upon the altitude above the ground surface. A portion of those emissions may be Volatile Organic Compounds (VOC), which are associated with the generation of ground level ozone. However, the volume of aircraft operations at the WFF is relatively small and the area is considered to be an attainment area for ozone levels (Reference 2).

Table 3-4 Air Quality Guidelines For Exposure To Rocket Exhaust (per Reference 9)

COMBUSTION PRODUCT	CAS NO.	TWA mg/m³	CEILING mg/m³	PEL mg/m³
Aluminum oxide (as Aluminum)	1344-28-1	-	-	15 (total)
Chlorine	7782-50-5	-	1.45	3
Hydrochloric acid	7647-01-0	-	7	7
Lead, inorganic Dusts and fumes (as Pb)	7439-92-1	0.050	-	0.050

Abbreviations:
CAS No. = Chemical Abstract System Number
TWA = Time-Weighted Average
CL = Ceiling Limits
PEL = Permissible Exposure Limits
mg/m^3 = Milligrams per cubic meter

Table 3-5 Dispersion Characteristics Within Selected Atmospheric Layers

ATMOSPHERIC LAYER ALTITUDE RANGE (kilometers / miles)	TEMPERATURE STRUCTURE	WIND STRUCTURE	CHARACTERISTIC MIXING RATE
Below nocturnal inversion (0 - 0.5 / 0 – 0.3)	Increase with height	Very light or calm	Very poor
Below subsidence inversion (0 - 1.5 / 0 – 0.9)	Decrease with height to inversion base	Variable	Generally fair to inversion base
Troposphere (0.5 – 20 / 0.3 – 12.5)	Decrease with height	Variable; increase with height	Generally very good
Stratosphere (20 – 67 / 12.5 – 40)	Isothermal or increase with height	Tends to vary seasonally	Poor to fair
Mesosphere –Thermosphere (67+ / 40+)	Decrease with height	Varies seasonally	Good

Jet fuel dumping in an emergency requires the operator or owner of the aircraft to notify the local FAA Air Traffic Control Tower (WFF Control Tower) and the National Response Center Hotline.

3.2.4 Noise

Noise is defined as any loud or undesirable sound. The standard measurement unit of noise is the decibel (dB), generally weighted to the A-scale (dBA), which corresponds to the range of human hearing. The Federal Noise Control Act (42 USC § 4901 *et seq.*) provides the basis for the EPA to encourage the development of state and local noise control programs, and directs federal agencies to comply with local community noise statutes. The Noise Control Act also directs federal agencies to carry out programs in a manner that minimizes noise impacts on public health and welfare.

While the Occupational Safety and Health Administration has set guidelines for the maximum length of time an employee can be exposed to continuous sound levels (beginning at 90 dB for 8 hours and not exceeding 110 dB for 30 minutes), national standards have not been established for noise outside of the work environment. The EPA guideline recommends a day/night average sound level of 55 dB to protect the public from the effects of broad band environmental noise in typically quiet outdoor and residential areas. The guideline is intended to protect against activity interference and annoyance. To protect against hearing loss in the general population from nonimpulsive noise, the EPA guideline recommends an equivalent sound level of 70 dB or less, or an L_{eq} (time average sound energy level) of 70 over a 40-year period.

A baseline noise analysis was performed for WFF during both peak and off-peak traffic periods. Noise sources included vehicular traffic, aircraft activities, and natural environmental sounds. Near the Main Base, sensitive receptors include homes, a campground/marina, and portions of the Wallops Island National Wildlife Refuge. Homes and buildings within the NASA boundaries are not considered to be sensitive receptors, but had been included in the analysis for comparative purposes in the event that additional analyses are carried out at a future date.

Homes along intersections and roadways adjacent to the Main Base generally experience noise levels of 56 to 61 dBA during peak traffic periods, and 54 to 58 dBA during off-peak traffic periods. However, higher noise levels were found at the busy intersection of State Routes 175, 679, and 798. At this site, noise levels ranged from 64 to 67 dBA during both peak and off-peak periods.

The Federal Highway Administration has established criteria for characterizing motor vehicle noise on roads constructed with Federal funds. The Federal Highway Administration criteria were used in analyzing baseline conditions because they represent established analysis for traffic noise levels. An exterior L_{eq} of 67 dBA is the standard typically used to evaluate outdoor noise levels along roadways. Therefore, this 67 dBA value was used to evaluate the noise levels in the vicinity of WFF.

Noise at homes in relatively quiet areas (away from the roadways) ranged from 49 dBA to 58 dBA, depending on the range of background noises. This range was determined for housing on the Main Base

itself, and areas north of the Main Base such as Dublin Farms and Trail's End Campground and Marina.

3.2.4.1 Subsonic Noise

When aircraft operations occur for an extended time period, areas near the ends of the airport runways sometimes experience noise that exceeds the 67 dBA criteria. The worst-case situation is represented by extended touch-and-go activities with one touch-and-go every 10 minutes. Under these conditions, the 1-hour L_{eq} is 80.5 dBA several hundred feet from the end of a runway (see Figure 3-4). This noise level would be experienced at the Trail's End Campground and Dublin Farms, north of the Main Base; the Wallops Island National Wildlife Refuge, adjacent to the eastern boundary of the Main Base; homes along State Route 175, south of the Main Base; and some homes along Flemens Road, west of the Main Base.

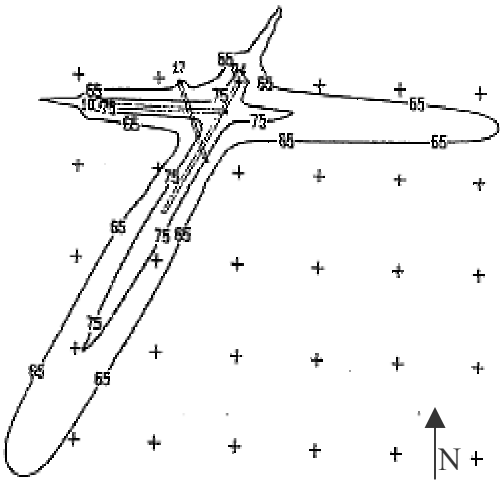


Figure 3-4 Noise Profile of WFF Runways

Launch noise has been part of the ambient noise levels over the last 46 years (see Figure 3-5). Noise levels and frequencies are basically dependent upon the thrust of the launch motors. The Conestoga launch vehicle is the largest vehicle launched from Wallops Island, to date. An overall sound pressure level (OSPL) of approximately 107 dB resulting from the Conestoga could extend as far as 12 kilometers (7.5 miles) from the launch site. For comparison purposes, close proximity to either a passing truck or a punch press is equivalent to 100 dB and 110 dB, respectively. The towns of Atlantic and Chincoteague, as well as some farms, are located within this 12 kilometer (7.5 mile) radius. The OSPL would be maintained for one to two seconds and then rapidly decrease. Noise levels from launch vehicles attenuate rapidly, are low frequency, and occur infrequently (Reference 2).

Figure 3-5 Launch Range Noise Impact Area

3.2.4.2 Supersonic Noise

Supersonic, low flying target launches are limited to Wallops Island eastward over the Atlantic Ocean. Several factors influence sonic booms: weight, size, and shape of target; altitude; flight path; and weather or atmospheric conditions. A larger and heavier target must displace more air and create more lift to sustain flight, compared with a small, light target. Therefore, larger

targets create sonic booms that are stronger and louder than those of smaller, lighter targets. Consequently, the larger and heavier the target, the stronger the shock waves would be (Reference 5).

Of all the factors influencing sonic booms, increasing the altitude of the target is the most effective method of reducing the sonic boom intensity. The width of the boom "carpet," or area exposed to sonic boom beneath a target is about 1.6 kilometers (1 mile) for each 300 meters (1,000 feet) of altitude. The sonic boom, however, would not be uniform. Maximum intensity is directly beneath the target and decreases as the lateral distance from the flight path increases, until the shock waves refract away from the surface and the sonic boom attenuates. The lateral spreading of the sonic boom depends only upon the altitude, speed, and the atmosphere, and is independent of the vehicle's shape, size, and weight. The ratio of target length to maximum cross sectional area also influences the intensity of the sonic boom. The longer and more slender the target, the weaker the shock wave, while the wider and more blunt the vehicle, the stronger the shock waves can be (Reference 5).

In recent tests, the maximum boom measured during flight conditions was 102.5 kilograms per square meter (21 pounds per square foot). The energy range of sonic boom is concentrated in the 0.1 - 100 hertz frequency range. These frequencies are considerably below those of subsonic aircraft, gunfire and most industrial noise. The duration of sonic boom is brief, usually less than a second for most fighter-sized aircraft (Reference 10).

3.2.5 Hazardous Materials and Hazardous Waste

3.2.5.1 Hazardous Materials

In May of 2001, the DEQ issued its formal approval of the WFF's Integrated Contingency Plan (ICP) (Reference 11). The ICP, developed by the Environmental Office in accordance with the Federal Hazard Communication Program, includes the procedures outlined below.

Wallops Flight Facility labels each container of hazardous chemical in English with the following minimal descriptions: the name of the chemical material and all appropriate hazard warnings.

Wallops Flight Facility maintains Material Safety Data Sheets (MSDS), in each work area, for each hazardous chemical used on site. Each MSDS is in English and contains all required information. The WFF Environmental Office has created an electronic chemical inventory that contains links to appropriate MSDS. The MSDS-Pro software, which is maintained by the Safety Office, is online and is accessible to all WFF personnel through the GSFC intranet.

Individual WFF support contractor offices train their personnel on the applicable hazardous communication pertinent to the requirements for each employee.

3.2.5.2 Hazardous Waste Management

Approximately 11.2 kilometers (7 miles) of public roadway separates the Main Base from Wallops Island and the Mainland. Therefore, to prevent unauthorized transportation of hazardous wastes, the EPA has assigned each landmass a separate identification number (i.e., VA8800010763

for the Main Base and VA7800020888 for the Main Land and Wallops Island combined). In addition, Wallops Island has an Interim Status Treatment, Storage, and Disposal Facility (TSDF) Permit for the OB/OD area.

The DEQ annually inspects the WFF hazardous waste handling and management operations. The regulations which govern hazardous waste management are referenced in 40 CFR 260-270 and 9 VAC 20-60. The Environmental Office manages hazardous wastes generated at WFF including inspection, on-site transportation, storage, and shipment of all hazardous waste. The Environmental Office is responsible for tracking manifests and certificates of disposal for hazardous wastes, which leave the facility. Last fiscal year, 2002, the Environmental Office arranged shipping for 27,354 kilograms (60,306 pounds) of hazardous waste to off-site TSDF's. The Environmental Office also provides annual Hazardous Waste training to all Civil Service and Contractor employees who handle hazardous waste as part of their job.

The generators at each operation or activity are responsible for:

- Properly containerizing waste.
- Properly completing and transferring the disposal inventory sheet to the Environmental Office.
- Properly labeling waste containers with information pertaining to the contents and with the words: "Hazardous Waste," if applicable.

The Hazardous Waste Technicians at each operation or activity are responsible for:

- Inspecting the material.
- Transporting the waste to an accumulation area.

The WFF has established a Pollution Prevention Plan and a coordinator who is responsible for administering this Plan. Pollution Prevention teams are formed as needed to address specific Pollution Prevention opprotunities. Representatives of the Environmental Office, the Purchasing Department, Facilities Management, and the Logistics Office form the Recycling Team at WFF. This Team actively seeks ways to reduce, reuse, or recycle solid wastes. A chemical reutilization database is available and maintained by the Environmental Office.

3.2.5.3 Areas of Concern

Several previous sites of contamination, or Areas of Concern, exist at the facility and are scheduled for, or undergoing, remediation. These Areas of Concern at the WFF resulted from past practices and activities. These areas are being addressed as part of a voluntary remedial investigation in cooperation with EPA Region III and DEQ.

3.3 BIOLOGICAL ENVIRONMENT

3.3.1 Vegetation

Wallops Island is a barrier island maintaining diverse flora communities including beaches, dunes, swales, maritime forests, and marsh.

Few plants are able to thrive in the beach community due to constant wave action. Phytoplankton, macroalgae and algae are prevalent within this community. Dominant species within the dune community include seabeach orach, common saltwort, sea rocket, american beachgrass and seaside goldenrod. These species are very adaptable

to harsh conditions and must contend with high temperatures, high winds, salt, sandblasting and drought.

The southern end of the island contains a swale zone that extends to the tidal marsh on the western side. On the northern end, the swale zone is host to northern bayberry, wax myrtle, groundsel-tree and American beach grass which extend to the maritime forest. Loblolly pine and cherry trees with an understory of northern bayberry, wax myrtle, and groundsel-tree are predominant in the maritime forest (Reference 2).

Phragmites australis (common reed) and lawn areas, introduced and maintained by man, dominate the central portion of the island. Due to successful competition in areas with very low habitat value, the common reed has virtually overrun this section of the island.

The western side of the island is tidal marsh with intertwining guts (small streams). Tidal marshes are low-lying wetlands influenced by tides. The low marsh, which is flooded at high tide, is dominated by saltmarsh cordgrass. Salt meadow cordgrass is predominant in the high marsh. Tidal marshes provide essential plant life for which the chain of marine life is reliant. Numerous marine, avian, and terrestrial species depend on the marsh for survival (Reference 2).

3.3.2 Terrestrial Wildlife and Migratory Birds

Herbaceous and wooded areas provide a haven for amphibian, reptilian, avian, and mammalian species. Fowler's toad, green tree frog, black rat snake, hognose snake, box turtle, and the northern fence lizard are among the amphibians and reptiles existing in this area. Birds common to the swale zone include various species of sparrows, red-winged blackbirds, boat-tailed grackles, fish crows, song sparrows, gray catbirds, and mourning doves. Mammalian species such as raccoon, red fox, white-footed mouse, meadow vole, opossum, raccoons, gray squirrels, and the cottontail rabbit also thrive in this region. White-tailed deer are over abundant on both Wallops Island and the Mainland (Reference 2).

The Migratory Bird Treaty Act (MBTA) was enacted to ensure the protection of shared migratory bird resources. The MBTA prohibits the take and possesion of any migratory bird, their eggs, or nests, except as authorized by a valid permit. A migratory bird is any species that live, reproduce, or migrate within or across international borders at some point during their annual life cycle. The Atlantic Flyway route from the northwest is of great importance to migratory waterfowl and other birds. The coastal route of the Atlantic Flyway, which in general follows the shore line, is a regular avenue of travel for migrating land and water birds, that winter on the waters and marshes south of Delaware Bay. Ducks, geese, shorebirds, and songbirds pass through the Atlantic Flyway, using WFF as a stopover and an overwintering area.

3.3.3 Threatened and Endangered Species

Section 7(a)(2) of the Endangered Species Act (ESA) requires federal agencies to insure that their actions do not jeopardize the continued existence of any listed endangered or threatened species. A species is considered “endangered” if it is in danger of extinction throughout all or a significant portion of its range and “threatened” if it is

likely to become endangered in the foreseeable future.

The 1999 ERD (Reference 2) and the 1997 Vegetative Management Plan (Reference 12) contain listings of threatened or endangered species in the WFF vicinity as of 1999 and 1995, respectively. The WFF is obligated to protect any state or federally listed species discovered on the facility.

The following federal and state agencies oversee the classification and regulations of the endangered and threatened flora and fauna species at WFF:

- United States Department of the Interior, Fish and Wildlife Service,
- Commonwealth of Virginia Department of Agriculture and Consumer Services,
- Commonwealth of Virginia Department of Game and Inland Fisheries,
- Commonwealth of Virginia Department of Conservation and Recreation, Division of Natural Heritage, and the
- United Stated Department of Commerce, National Oceanic and Atmosheric Administration, National Marine Fisheries Services.

Table 3-6 lists the species that are considered threatened or endangered in the WFF area. Federal or state threatened and endangered birds may be found at various locations on WFF. During their migratory season, upland sandpipers may occur in large grassy areas such as those adjacent to the runway on the Main Base. Gull-billed terns, piping plovers and Wilson's plovers may nest on beach or mud flats on Wallops Island. A resident pair of peregrine falcons nests on a hacking tower on the northwest side of Wallops Island. Migrating peregrine falcons occur along the Wallops Island beach during fall migration. An inactive bald eagle nest exists on the northern border of the WFF Main Base. Refer to Section 4.0 of the 1999 ERD for more information on Threatened and Endangered Species (Reference 2).

Table 3-6 Threatened and Endangered Species in the WFF Area

SCIENTIFIC NAME	COMMON NAME	STATUS
Reptiles		
Caretta caretta	Loggerhead Sea Turtle	Federal Threatened
Chelonia mydas	Atlantic Green Sea Turtle	Federal Threatened
Dermochelys coriaces	Leatherback Sea Turtle	Federal Endangered
Eretmochelys imbricata	Hawksbill Sea Turtle	Federal Endangered
Lepidochelys kempi	Kemp's Ridley Sea Turtle	Federal Endangered
Birds		
Bartramia longicauda	Upland Sandpiper	State Threatened
Charadrius melodus	Piping Plover	Federal Endangered
Charadrius wilsonia	Wilson's Plover	State Endangered
Falco peregrinus	Peregrine Falcon	State Endangered
Haliaeetus leucocphalus	Bald Eagle	Federal Threatened
Sterna nilotica	Gull-billed tern	State Threatened

As part of WFF's management practices, both the northern and southern ends of Wallops Island beach are closed during the piping plover nesting season (March 15 through September 15). Biologists from the Chincoteague National Wildlife Refuge and from the Virginia Department of Game and Inland Fisheries monitor nesting activities (Figure 3-6).

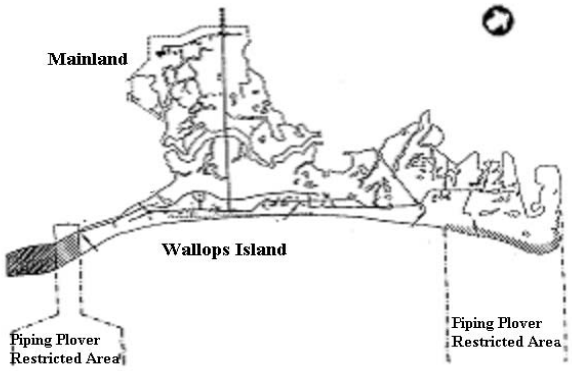


Figure 3-6 Piping Plover Management Areas

3.3.4 Marine Mammals and Fish

All marine mammal species are protected by the Marine Mammal Protection Act (MMPA). The MMPA prohibits the "taking" of marine mammals, where "take" is defined as any harm or harassement. Section 101(a)(5) of the MMPA directs the Secretary of the Department of Commerce to allow, upon request, the incidental (but not intentional) taking of marine mammals. There are 40 marine mammals species with possible or confirmed occurrence in the VACAPES OPAREA. Included are cetaceans (whales, dolphins, and porpoises) and pinnipeds (seals). See Table 3-6 below for the most common marine mammals confirmed in the VACAPES OPAREA.

The Manguson-Stevens Fishery Conservation and Management Act establishes management authority over all fishing within the U.S. Exclusive Economic Zone, all migratory fish throughout their migration route, and all fish on the continental shelf. The Mid-Atlantic Fisheries Management Council (MAFMC) manages the VACAPES OPAREA fisheries. The Sustainable Fisheries Act described and identified the essential fish habitat (EFH) for each fishery management plan. The EFH is defined as the waters or substrate necessary for fish to spawn, breed, feed, or grow or maturity. A total of 105 EFH species occur within the VACAPES OPAREA including fish, invertebrates, and macroalgal species (Reference 8).

Common fish inhabiting the waters surrounding Wallops Island include the sandshark, smooth dogfish, smooth butterfly ray, bluefish, spot, croaker, sea trout, and flounder (Reference 2).

3.4 SOCIAL AND ECONOMIC ENVIRONMENT

3.4.1 Population

The WFF is located in Accomack County, Virginia, a rural area with low population densities. Chincoteague Island is the largest populated area near WFF, with a resident population of almost 3,600 people. This serene fishing village, 11.26 kilometers (7 miles) long (north-to-south) and 2.4 kilometers (1.5 miles) wide, is the gateway to Assateague Island National Seashore. Vacationers visiting the seashore inflate the population of this small island to approximately 15,000 during the summer, while special events such as pony penning and the firefighters' carnival can swell the population to approximately 40,000.

Table 3-7 Marine Mammals in the VACAPES OPAREA

Scientific Name	Common Name	Status
Kogia breviceps	Pygmy Sperm Whale	MMPA
Kogia simus	Dwarf Sperm Whale	MMPA
Mesoplodon mirus	True's Beaked Whale	MMPA
Mesoplodon densirstris	Blainville's Beaked Whale	MMPA
Mesoplodon bidens	Sowerby's Beaked Whale	MMPA
Ziphius cavirostris	Cuvier's-Beaked Whale	MMPA
Hyperoodon ampullatus	Northern Bottlenose Whale	MMPA
Steno bredanensis	Rough-Toothed Dolphin	MMPA
Tursiops truncatus	Bottlenose Dolphin	MMPA
Stenella frontalis	Atlantic Spotted Dolphin	MMPA
Stenella attenuata	Pantropical Spotted Dolphin	MMPA
Delphinus spp.	Common Dolphin	MMPA
Lagenodelphis acutus	Atlantic White-Sided Dolphin	MMPA
Grampus griseus	Risso's Dolphin	MMPA
Stenella coeruleoalba	Striped Dolphin	MMPA
Stenella longirostris	Spinner Dolphin	MMPA
Stenella clymene	Clymene Dolphin	MMPA
Peponocephala crassidens	Melon-Headed Whale	MMPA
Globicephala macrorhynchus	Short-Finned Pilot Whale	MMPA
Globicephala melas	Long-Finned Pilot Whale	MMPA
Phocoena phocoena	Harbor Porpoise	MMPA
Phoca vitulina	Harbor Seal	MMPA
Halichoerus grypus	Gray Seal	MMPA

3.4.2 Recreation

Late spring, summer, and early fall attract numerous tourists and vacationers to the Eastern Shore. Assateague Island National Seashore, with its 24 kilometers (15 miles) of pristine shoreline, offers relaxation and recreation for many visitors. Winter provides plentiful game for hunters while, bird watchers are in evidence year-round. The Chincoteague National Wildlife Refuge offers various trails and is home to many birds and animals including the Chincoteague pony.

Two herds of wild horses make their home on Assateague Island**,** separated by a fence at the Maryland-Virginia line. The Virginia herd is owned by the Chincoteague Volunteer Fire Company and allowed by permit to graze on the Chincoteague National Wildlife Refuge**.** Each year the Virginia herd is rounded up for the internationally recognized Pony Penning and Auction. Pony Penning is held on the last Wednesday and Thursday of July when members of the Fire Company herd the horses across the narrowest part of Assateague. The Pony Auction not only

provides a source of revenue for the fire company, but it also serves to trim the herd's numbers. To retain the permit to graze on the refuge, the herd must not exceed 150 horses. Each year thousands of people gather on Chincoteague Island to watch the Pony Penning and enjoy the Firemen's Carnival.

Between 1991 and 2000, the commercial landings of food and bait fish averaged 280 million kilograms (616 million pounds), with over 37 percent landed during July and August. The dollar values of these landings averaged approximately $107 million, over the decade. In 2000, finfish dominated the catches, representing over 91 percent of the landings, by weight. Shellfish comprised the remaining 9 percent. In terms of dollar value, however, finfish accounted for less than 57 percent with shellfish totalling over 43 percent of profits from commercial fishing (Reference 8).

The Eastern Shore offers many opportunities for boating and fishing enthusiasts during the summer. Between 1988 and 1997, marine recreational landings for Virginia averaged approximately 1.6 million kilograms (3.6 million pounds). In 2001, tuna and mackerel accounted for the first-ranked species group with over 62 percent of the total recreational landings off the coast of Virginia. Sea bass were the second-ranked group, comprising approximately 9 percent of the 2001 recreational landings (Reference 8).

Over 224,000 fishing trips were taken in 2001 by individual recreational anglers fishing off the coast of Virginia. The Marine Recreational Fishery Statistics Survey (MRFSS) conducted by the National Marine Fisheries Service (NMFS) provides estimates of fishing effort, catch, and participation by recreational anglers in the marine waters of the U.S. According to the MRFSS estimates, almost 1.9 million people participated in recreational, marine fishing in waters of the coast of Virginia (Reference 8).

Numerous groups and clubs organize a variety of fishing tournaments during the summer months. Table 4-3 lists the 2003 commercial (c) and tournament (t) fishing schedules.

Table 3-8 2003 Commercial and Tournament Fishing Schedules

Event	Site	Date
Conk Season [c]	Mid-April to June	
OC Reef Open [t]	Ocean City	June 1
Shark [t]	Ocean City	June 5–7
Shark [t]	Ocean City	June 12–14
Small Boat Tournament [t]	Ocean City	June 20– 2
Tuna [t]	Wachapreague	June 26–29
Canyon Kick-Off [t]	Ocean City	July 3–6
Tuna [t]	Ocean City	July 10-13
Marlin [t]	Wachapreague	July 24–27
Marina Shoot-Out [t]	Ocean City	July 25–27
Pony Swim	Chincoteague	July 30 – August 1
Marlin [t]	Ocean City	August 4–8
Mid-Atlantic Open [t]	Ocean City	August 14–16
Offshore & Mini-Flounder [t]	Ocean City	August 16–18
Tuna [t]	Wachapreague	August 17
Tuna [t]	Ocean City	August 22-24
Marlin [t]	Ocean City	August 28-31
Marlin [t]	Wachapreague	September 6
Challenge Cup [t]	Ocean City	September 11–13

3.4.3 Employment and Income

With approximately 5 percent of the total work force in Accomack and Northampton Counties, WFF is the third largest employer in Accomack County. In fiscal year 1999, NASA employed 233 civil service and 711 support contractors. The combined Navy centers employed 372 military, civilian, and contractor personnel in fiscal year 1998. NOAA employed 99 people in the same fiscal year. Employment records from 1981 through 1999, indicate an increase of 23 percent and 92 percent employment for NASA and the Navy, respectively. During that same time, employment at NOAA decreased by 0.06 percent (Reference 2).

Employment in Accomack and Northampton Counties fluctuates seasonally, throughout the agricultural and seafood industries. During the months of June to October, the greatest number of residents is employed in the civilian labor force. These months also result in the lowest rates of unemployment, usually between 6 and 4 percent, respectively. The unemployment rate as of April 1999 was 6.0 percent for Accomack and 3.4 percent for Northampton Counties, with a combined unemployment rate of 5.3 percent. The civilian labor force in these counties totaled 19,594 (Reference 2).

3.4.4 Health and Safety

WFF maintains 24-hour fire protection stations on the Main Base and on Wallops Island. Response personnel are trained in hazardous materials emergency response, crash rescue, and fire suppression.

Mutual aid agreements have been established between WFF and the local volunteer fire companies for any additional assistance. Additional response would be handled by the closest volunteer companies in Atlantic and Chincoteague.

The WFF Safety Office is responsible for approving project-specific ground and flight safety plans, while management is responsible for approving the Operations and Safety Directive (OSD) for each activity. The following documentation has been prepared to provide specific guidance for emergency response:

- *Integrated Contingency Plan, NASA Goddard Space Flight Center's Wallops Flight Facility, Wallops Island, Virginia 23337*, 2001 (Reference 11);
- *Range User's Handbook, Revision 2,* 2001 (Reference 13);
- *Range Safety Manual (RSM-2002) For Goddard Space Flight Center Wallops Flight Facility, WFF Safety Office, Suborbital and Special Orbital Projects Directorate*, 2002 (Reference 14);
- *Wallops Safety Manual for Wallops Flight Facility, August 28, 2002, WFF Safety Office; Suborbital and Special Orbital Projects Directorate,* 2002 (Reference 15);
- *NASA Department Operating Guideline, Hydrazine Response Plan*, 2002 (Reference 16); and the
- *Hurricane Preparation and Recover*y, 2002 (Reference 17).

A 24-hour security force serves both the Main Base and the Mainland/Wallops Island. The security force is responsible for internal security of the base, employee and visitor identification, after-hours security checks, and police services. State, county, and town officers provide police protection for the surrounding areas.

Three local emergency health services are located in the vicinity of WFF. Wallops Flight Facility has its own health unit with a full-time nursing staff and physician to provide first aid and immediate assistance to patients in emergency situations. The Health Unit operates from 8:00 a.m. to 4:30 p.m.

After-hours emergency medical care is provided by Emergency Medical Services staff of the WFF Fire Department. The Chincoteague Medical Center on Chincoteague Island and the Atlantic Medical Center in Oak Hall, Virginia, also provide emergency assistance, and are both located within 8 kilometers (5 miles) of the WFF area. Four hospitals are also located in the region, all approximately 64 kilometers (40 miles) from WFF, including:

- Atlantic General Hospital in Berlin, Maryland
- McCready Memorial Hospital in Crisfield, Maryland
- Peninsula Regional Medical Center in Salisbury, Maryland
- Shore Memorial Hospital in Nassawadox, Virginia

The Peninsula Regional Medical Center serves as the regional trauma center for the Delmarva Peninsula. If additional trauma care is needed, Sentara Norfolk General Hospital is 19 minutes away (by helicopter) from Shore Memorial Hospital in Nassawadox. Accomack and Northampton County Health Departments offer clinical services. Worcester, Somerset, and Wicomico Counties also have health departments. Five nursing homes on Virginia's Eastern Shore and eight nursing homes on Maryland's Lower Eastern Shore are available to the community.

3.4.5 Cultural Resources

According to the National Register Criteria for Evaluation, properties claiming to have achieved significance within the last 50 years may be listed on the National Register of Historic Places, only if they are of "exceptional importance," or if they are integral parts of districts that are eligible for listing in the National Register. Properties greater than 50 years are presumed historic unless proven otherwise.

As stated in 36 CFR Part 800.16, the "Area of Potential Effects" is defined as the geographic area or areas within which an undertaking (action) may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The Area of Potential Effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.

A cultural investigation was performed by 3D/Environmental Services, Inc. (3D/ESI) of Alexandria, Virginia. Architectural history and survey services were provided by the firm of Kise, Franks and Straw, of Philadelphia, Pennsylvania. The result of this investigation is a report entitled *Architectural and Archaeological Cultural Resources Inventory for NASA's Wallops Flight Facility, Accomack County, Virginia Preliminary Findings*, dated December, 1991 (Reference 18).

3D/ESI applied the Criteria for Evaluation as outlined in 36 CFR Part 60, National Register of Historic Places. 3D/ESI took into consideration the three separate sections of real property and the age, evolution, and function of each section. Based on background archival research combined with

a windshield architectural survey, an inventory of standing structures and a preliminary discussion of the integrity and potential significance of the buildings at WFF were reported.

The Main Base was evaluated for its association with both NASA and the Chincoteague Naval Air Station and Naval Ordinance Center. The buildings, structures, sites, and objects associated with the Naval Air Station build-up do not appear eligible based on the cumulative loss of integrity due to extensive demolition or alterations. At present, only three resources retain a relatively high level of integrity.

The construction undertaken by NASA after acquiring the site in 1959 does not appear to warrant eligibility status because it has not achieved to date exceptional significance under Criteria A, B, or C.

The NASA Suborbital Program missions associated with the Main Base, although significant to the study of and advancement of space, earth science, and aeronautical research, date only from the 1960s to the present. Given the relatively recent nature of these actions, it appears that not enough time has elapsed to allow for a historical perspective on the significance of the resources associated with the Suborbital Program.

The Mainland and Wallops Island sections of WFF were initially developed under the National Advisory Committee for Aeronautics (NACA) as a research and testing facility in conjunction with Langley Research Center. The Wallops Island facility was one of several research and testing facilities associated with the NACA. It appears that the early actions associated with Wallops Island and NACA have achieved exceptional importance with in the last fifty years. However, the surveyed buildings, structures, sites, and objects have cumulatively lost their integrity, and no longer have the ability to convey their historic appearance and associations.

The only building from the early NACA efforts, which appears to retain a high level of integrity, and may warrant consideration for Register listing, is the General Services Building (number X-55) constructed in 1946.

In addition to resource X-55, resource numbers V-065 and V-010, the Old Coast Guard Station and the Observation Tower appear to warrant Register listing under Criteria A and C. Both structures are listed in the NASA Real Property Lists as constructed in 1936, although the Coast Guard Station may originally date to 1883.

3.4.6 Environmental Justice

The basic goal of environmental justice is to ensure fair treatment of people of all races, cultures, and economic situations with regard to the implementation and enforcement of environmental laws and regulations, and federal policies and programs. Executive Order (EO) 12898, "Federal Action to Address Environmental Justice in Minority Populations and Low Income Populations," (and the February 11, 1994, Presidential Memorandum providing additional guidance for this EO) require that federal agencies develop strategies for protecting minority and low-income populations from disproportionate and adverse effects of federal programs and activities. The EO is "...intended to promote non-discrimination in Federal programs substantially affecting human health and the environment." This EA examines the

various impacts of the AQM-37 operations to determine if any impact from the activities would be experienced disproportionately and adversely by minority or low-income communities within geographic areas in which the activities occur. Each environmental attribute addressed in this EA has been scrutinized from an environmental justice perspective. Thus, for example, if significant levels of air pollution resulted from AQM-37 operations, the question, from the environmental justice perspective, would be whether this pollution would disproportionately and adversely impact areas in which minority or low-income populations reside in proportions greater than in the general population.

Wallops Flight Facility has prepared an Environmental Justice Implementation Plan (EJIP) to comply with EO 12898. A review of Accomack County census data provided the baseline for the facility's EJIP. This review found no low-income or minority communities occurring along the borders of WFF.

Chincoteague Island is the closest populated area to the seaward side of Wallops Island. No minority or low-income communities exist on the portion of Chincoteague Island that lies within a 4 kilometer (2.5 mile) radius of Wallops Island.

EO 13045, "Protection of Children From Environmental Health Risks and Safety Risks," encourages Federal agencies to consider the potential effects of its policies, programs, and activities on children. Consistent with NEPA, this and other EO's concerned with impacts to the human environment, has been analyzed in this document. The closest day cares, schools, camps, nursing homes, and hospitals are addressed.

3.4.7 Transportation

The Eastern Shore of Virginia is connected to the rest of the state by the double span of the 28.3 kilometer (17.6 mile) long Chesapeake Bay Bridge Tunnel. The primary north-south route that spans the Delmarva Peninsula is U. S. Route 13, a four-lane divided highway. Local traffic travels by arteries branching off of U. S. Route 13. Access to WFF is provided by State Route 175 to State Route 178, a two-lane secondary road (Figure 3-7). Traffic in the region of WFF varies with the seasons. During the winter and early spring, traffic is minimal, while during the summer and early fall, traffic increases due to tourism (Reference 2).

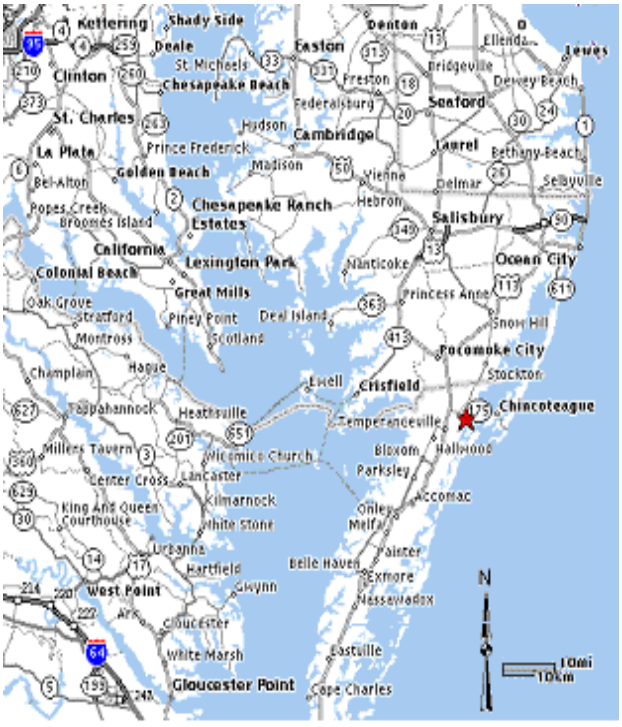


Figure 3-7 Road Atlas of the Delmarva Peninsula
(Copyright MapquestTM, 2002)

Commercial air service is provided through the Norfolk International Airport (about 145 kilometers (90 miles) to the south) and by Salisbury Regional Airport (about 64 kilometers (40 miles) to the north) of WFF. Air service is also available through the Accomack County Airport in Melfa about 64 kilometers (40 miles) to the south, which usually provides flights only during daylight hours. Surface transportation from the airports to the facility is by private rentals, government vehicles, and commercial bus or taxi.

Chartered and private aircraft, both piston and jet type, may land, with the proper clearance, at WFF Airport for business purposes. Air-freight services are available from the Salisbury Regional Airport and are provided by U.S. Airways Express and Wiggins Airways.

Rail freight service is provided to the peninsula by the Eastern Shore Railroad. No rail passenger service is available to WFF. Eleven motor freight carriers that serve the eastern United States are authorized to provide service to the Accomack-Northampton District.

Ocean cargo shipments are off-loaded at the Port of Baltimore (Maryland) or Cape Charles (Virginia) and then transferred to commercial trucks or rail for transportation to WFF. There are numerous small harbors located throughout Accomack and Northampton Counties, which are used primarily for commercial or recreational fishing and boating (Reference 2).

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This section describes the potential environmental impacts associated with the flight operations of the military aircraft, flight operations of the AQM-37 target, and impact of the target body or parts in the VACAPES OPAREA. Direct, indirect, and cumulative impacts are evaluated as appropriate. The analysis of alternatives is discussed in Chapter 2.0, Alternatives Including the Proposed Action.

Federal and state environmental laws and regulations were reviewed to determine thresholds for assessing environmental impacts. The proposed activities were evaluated to determine their potential to result in significant environmental consequences. The interpretation of significance is defined in 40 CFR 1508.27.

In the following sections, impacts are discussed in proportion to their importance, with only brief discussions of minor issues. The WFF has determined that health and safety had the greatest potential for adverse impacts.

4.2 PHYSICAL ENVIRONMENT

4.2.1 Land Resources

4.2.1.1 Geology and Soils

Impacts on geology and soil from the proposed activities would be negligible. All activities would take place at, or immediately adjacent, to existing facilities and on impervious surfaces (i.e., concrete, tarmac, asphalt).

The WFF ICP (Reference 11) would ensure the safe storage, transfer, and mixing of hazardous materials. Accidental releases of hazardous fuels, hydraulic fluids, and cleaning liquids would be addressed by the ICP and the AQM-37 Contingency Plan. Any liquids accidentally released would be contained in accordance with the management and response plans, resulting in minimal impact to geology or soil. Any gaseous materials accidentally released would vent to the atmosphere and would not impact on geologic resources or soil.

The WFF has procedures and policies in the ICP for firefighting, hazardous material containment, and cleanup in response to accidents. In the event of an accident on the runway, the impacts on soil resources from the jet fuels and firefighting materials would be similar to the impacts from any other aircraft accident. The target fuels released in an accident on the runway would be consumed in a fire or contained. Any residual target fuels would evaporate rapidly from surface soil. Sunlight would also augment degradation of remaining fuel or oxidizer. Therefore, no negative impact to geology or soil is anticipated.

4.2.1.2 Land Use

As WFF is classified as “Industrial” by Accomack County and given the extensive military and space operations history of WFF, dating back to 1945, the Proposed Action remains consistent with prior land use and activities.

4.2.1.3 VACAPES OPAREA Substrate

Hazardous constituents may impact benthic marine organisms by affecting sediment quality. NOAA has developed values that rank the effects versus concentration for various metals and organics. The Effects Range-Low (ER-L) values were determined to be a concentration at the low end (10 percent) of the range in which effects were observed. Due to their potential to affect ocean bottom sediments, battery constituents are of particular concern. Table 4.1 lists the NOAA values for battery constituents.

Table 4-1 NOAA Values

Constituent	ER-L (ppm)
Nickel (Ni)	20.9
Lead (Pb)	46.7
Cadmium (Cd)	1.2
Copper (Cu)	34.0
Mercury (Hg)	0.15
Silver (Ag)	1.0
Zinc (Zn)	150.0

Hazardous constituents of concern for the AQM-37 include lubricating oils, hydraulic fluid, and silver-zinc batteries. Since IRFNA (the oxidizer) and MAF-4 (the fuel) completely decompose in the presence of water, neither of these constituents would settle in the substrate. Therefore, the main source of contaminants considered for the AQM-37 is the battery pack. The main battery assembly consists of 25 silver-zinc alkaline rechargeable cells with potassium hydroxide as the electrolyte. In Section 4.5 "Marine Biology" of Reference 5, NAWCWPNS determined sediment quality impact calculations for battery constituents. The resulting concentration of battery constituents in marine sediments was calculated to be approximately 0.1100 ppm. This value is below the criteria established by NOAA. Moreover, the probability of the same area of marine sediment being affected more than once in a given year is very low. Therefore, the battery constituent concentration represents a less than significant impact on marine sediment quality for each target event and for long-term accumulation.

Corrosion of the AQM-37 hardware is another potential source of pollution to marine environments. However, toxic concentrations of metal ions are not produced because the corrosion rates are slow in comparison to the mixing and dilution rates associated with marine environments. Moreover, metal ions do not adhere to the sandy substrate of the VACAPES OPAREA, therefore, no negative impact to the substrate is anticipated.

4.2.2 Water Resources

4.2.2.1 Surface Water

Several federal statutes play important roles in protecting ocean and surface waters. The CWA was enacted by Congress to restore and maintain the chemical, physical, and biological integrity of U. S. waters. The CWA prohibits the discharge of oil or hazardous substance in Territorial Waters (i.e., 22 kilometers [12 nautical miles]) in quantities harmful to public health or welfare, or to the environment. The cleanup of oil and hazardous substance spills is addressed in the WFF ICP. The Marine Protection, Research, and Sanctuaries Act (MPRSA) also known as the "Ocean Dumping Act," (33 USC§ 1401 *et seq.*) regulates the transport of materials for the purpose of dumping in ocean waters.

As required by the CWA, the EPA has established the National Ambient Water Quality Criteria (NAWQC) (EPA Publication EPA-822-R-02-047, November 2002) which establishes numerical maximum concentration levels for contaminants in discharges to surface waters for the protection of both ecological and human health. The criteria, which apply to Territorial Waters, are not rules, and they do not have regulatory effect; however, they can be used to develop regulatory requirements based on concentrations that would have an adverse impact on the qualities necessary for existing beneficial uses of U. S. waters.

Hazardous constituents of concern for the AQM-37 include lubricating oils, hydraulic fluid, and silver-zinc batteries. Since IRFNA (the oxidizer) and MAF-4 (the fuel) completely decompose in the presence of water, they are not considered hazardous constituents. Additionally, except in the circumstance of aerodynamic termination, the propellants onboard the AQM-37 at the time of destruction, would be either consumed in the explosion (hypergolic reaction) or dispersed in the atmosphere. No propellants would reach the ocean in any significant concentration. Following aerodynamic termination, any remaining oxidizer and fuel in the target, would immediately neutralize in water.

The main source of contaminants considered for the AQM-37 is the battery pack. The main battery assembly consists of 25 silver-zinc alkaline rechargeable cells with potassium hydroxide as the electrolyte. Table 4-2 shows the NAWQC, in parts per billion (ppb), for possible AQM-37 contaminants expended in the VACAPES OPAREA.

Table 4-2 NAWQC Standards for Saltwater

Contaminant	NAWQC (ppb) Acute (1-hour)	NAWQC (ppb) Chronic (4-day)
Metals		
Nickel (Ni)	74.0	8.2
Lead (Pb)	210	8.1
Cadmium (Cd)	40	8.8
Copper (Cu)	4.8	3.1
Mercury (Hg)	1.8	0.94
Hydrazines		
1,2-diphenyl hyrazine	None	None

Corrosion of the AQM-37 hardware is another potential source of pollution to marine environments. However, toxic concentrations of metal ions are not produced because the corrosion rates are slow in comparison to the mixing and dilution rates associated with marine environments. Battery electrolytes and hydraulic fluids are in such small quantities that only temporary effects would be expected. Therefore, no negative impact to surface water is anticipated.

4.2.2.2 Ground Water

The only time that constituents from aircraft fuel emissions could impact ground water, would occur when the aircraft is on the ground or immediately prior to take-off. Since aircraft departing from the WFF would be on the airfield hot pad, which is covered with an impervious tarmac surface, no negative impacts are anticipated to the ground water from aircraft emission constituents. Moreover, no storm water runoff of residual particles is anticipated. The target fuels released in an accident on the runway would be consumed in a fire or contained. Any residual target fuels would evaporate rapidly from surface soil. Sunlight would also augment degradation of remaining fuels or oxidizers. Therefore, no negative impact to ground water is anticipated.

4.2.2.3 Wetlands

Wetlands exist in the flight path of the aircraft to the VACAPES OPAREA. If an aircraft mishap occurs over these wetlands, the wetlands could be negatively impacted. However, the risk of mishap is extremely slight; therefore, there is an insignificant increase in the risk of impacts to wetlands.

4.2.2.4 Floodplains

Since the AQM-37 operations would not take place within or adjacent to any mapped 100-year floodplains, no negative impacts to floodplains are anticipated.

4.2.2.5 Coastal Zone Management

NASA, through the NEPA process, has determined that the use of WFF and the VACAPES OPAREA for the AQM-37 operations would by fully consistent with the applicable policies of the VCP. The following information has been submitted to DEQ for consistency review. In a letter dated May 29, 2003, from Mr. Michael Murphy, Director of the Division of Environmental Enhancement of the DEQ, to Mr. William Bott, Environmental Group Lead for WFF, Mr. Murphy stated "…we concur with the finding that the proposed activity is consistent with the VCP…"

a. Fisheries Management – The WFF Public Affairs Office would meet with tournament organizers, fishing clubs, and Accomack County officials and issue a NOTMAR prior to AQM-37 launch operations. NOTMAR would be posted from Ocean City, Maryland to Wachapreaque, Virgina. The AQM-37 operations would be scheduled around planned and future tournament dates to minimize any negative impacts to the tourist and recreation economy in the VACAPES OPAREA. Therefore, WFF does not anticipate a significant impact on commercial or recreational fishing.

   The State Tributylin (TBT) Regulatory Program regulates the possession, sale, or use of marine antifoulant paints containing TBT. Since, TBT containing paints would not be used on any part of the AQM-37 target, no negative impacts to marine animal species are anticipated under the TBT Program.

b. Subaqueous Lands Management – Targets that enter the ocean as either a monolithic impact or debris would slowly settle to the bottomlands. Toxic concentrations of metal ions, however, are not produced because the corrosion rates are slow in comparison to the mixing and dilution rates associated with marine environments. Battery electrolytes and hydraulic fluids are in such small quantities that only temporary effects would be expected. Therefore, no negative impacts are anticipated to marine or fisheries resources, tidal wetlands, adjacent or nearby properties, anticipated public and private benefits, or water quality.

c. Wetlands Management – Wetlands exist in the flight path of the aircraft to the VACAPES OPAREA. If an aircraft mishap occurs over these wetlands, the wetlands could be negatively impacted. However, the risk of mishap is extremely slight; therefore, there is an insignificant increase in the risk of impacts to wetlands.

d. Dunes Management - Dunes exist in the flight path of the aircraft to the VACAPES OPAREA. If an aircraft mishap occurs over these dunes, the dunes could be negatively impacted.

However, the risk of mishap is extremely slight; therefore, there is an insignificant increase in the risk of impacts to dunes.

e. Non-point Source Pollution Control – Since there are no non-point sources of pollution associated with the proposed action, a Sediment and Erosion Control Plan would not be necessary.

f. Point Source Pollution Control – IRFNA (the oxidizer) and MAF-4 (the fuel) for the target, completely decompose in the presence of water, they are not considered hazardous constituents. Additionally, the propellants onboard the AQM-37 at the time of destruction would be either consumed in the explosion (hypergolic reaction) or dispersed in the atmosphere. No propellants would reach the ocean in any significant concentration. Therefore, there are no point sources of discharge associated with this operation.

g. Shoreline Sanitation – This project would not require sanitary services, either by the WFF sewer system or a septic tank. Therefore, no negative impact to either streams, rivers, or other waters of the Commonwealth of Virginia are anticipated.

h. Air Pollution Control – The emissions produced by AQM-37 activities would be minor and would have no significant regional impact. The AQM-37 targets would be shipped fully fueled from the NAWCWPNS. Therefore, no negative impacts from emissions related to fueling operations are anticipated. Emissions from ground operations, aircrafts, and the AQM-37 targets would not affect the air quality at WFF. The AQM-37 activities contain no new stationary sources that would require permits for criteria air pollutants or alterations to existing permits at WFF. Therefore, no negative impacts to the air quality of WFF are anticipated.

i. Coastal Lands Management - The Coastal Lands Management is a state-local cooperative program administered by the Chesapeake Bay Local Assistance Program. Since WFF lies east of the centerline of U. S. Route 13, it is outside the involvement of the Chesapeake Bay Local Assistance Program.

4.2.3 Air Quality

The WFF, which is located in EPA Air Quality Control Region 4 and Administrative Region 3, is in attainment for all NAAQS. Therefore, a conformity analysis is not required.

The emissions produced by AQM-37 activities would be minor and transient and would have no significant regional impact. The AQM-37 targets would be shipped fully fueled from NAWCWPNS. Therefore, no negative impacts from emissions related to fueling operations are anticipated.

Aircraft are exempt from the Commonwealth of Virginia regulations that govern emissions standards for mobile sources (9 VAC 5-40-5680). Aircraft operating from the WFF generally have reciprocating, turboprop, or jet engines. Most of theses aircraft use JP-5 as a standard fuel. Emissions of concern are primarily hydrocarbons that disperse readily in the atmosphere. A portion of those emissions may be VOC's, which are associated with the generation of ground level ozone. However, the volume of aircraft operations at WFF associated with AQM-37 activities is relatively small and the area is considered to be an attainment area for ozone levels.

Therefore, emissions related to aircraft activities for launching the AQM-37 targets are not anticipated to have a negative impact on the environment of WFF.

The launch of the AQM-37 target from the aircraft would generate emissions through the combustion of MAF-4 (the fuel) and IRFNA (the oxidizer). A "mole" is a measure of concentration. A "mole fraction" is the ratio of the amount of a substance (number of moles) to the total amount of a mixture. Mole fractions of the various combustion products of MAF-1 (a similar mixture of hydrazines) with IRFNA are summarized in Table 4-3. The mole fraction is independent of the amount of propellant. Of the predominant combustion products, carbon monoxide is the only one regulated by the EPA and the DEQ under the state adopted NAAQS. The emitted combustion products are distributed along the target trajectory under normal launch conditions. The quantities emitted per unit length of the trajectory are greatest at launch and decrease continuously (Reference 5).

Air emissions from the launch of similarly fueled vehicles (e.g., Pegasus launch vehicle) have been extensively described by NASA in References 19, 20, 21, and 22. Actual launch of the AQM-37 targets from WFF would be over open ocean. Based on the above references, NASA has determined that emissions from similarly fueled targets would be highly localized, of extremely short durations, and at an altitude that would readily facilitate exhaust dissipation. An annual maximum of 30 AQM-37 launches originating from WFF coupled with the fact that the actual launch trajectories would be variable, would reduce any potential for cumulative air quality impacts.

Table 4-3 Mole Fractions of the Various Combustion Products of MAF-1 with IRFNA

Compound	Mole Fractions
CO	0.05289
CO_2	0.17257
F	0.0000
H	0.00024
HF	0.00660
HNO	0.00000
HO_2	0.00000
H_2	0.3375
H_2O	0.48877
H_2O_2	0.0000
NO	0.0003
NO_2	0.00000
N_2	0.24480
O	0.00000
OH	0.00033
O_2	0.00001
Total Moles	0.0409
Moles of Gas	0.0409
Note: Theoretical rocket performance assuming equilibrium composition during expansion.	

Emissions from ground operations, aircrafts, and the AQM-37 targets would not affect the air quality at WFF. The AQM-37 activities contain no new stationary sources that would require permits for criteria air pollutants or alterations to existing permits at WFF. Therefore, no negative impacts to the air quality of WFF are anticipated.

4.2.4 Noise

4.2.4.1 Subsonic Noise

The WFF airport routinely hosts a variety of military and commercial aircraft (from twin engine, propeller driven aircraft, to F-18 fighter jets and 747 commercial craft) for "touch and go" flight qualifications,. A maximum increase of 30 additional F-16

flights a year, would have a negligible effect on WFF noise contours. When averaged over the year, an additional 30 flights per year would be less than 1 flight per week. When compared to the "average busy week," a deviation of 1 flight per week would represent a statistically meaningless change. Therefore, no negative impact is anticipated from subsonic noise.

4.2.4.2 Supersonic Noise

Potential noise impacts from the flight of a target include sonic booms. Sonic booms would occur with each target launch after the vehicle exceeded the speed of sound. The sonic boom would be directed toward the front of the vehicle. Due to the small size of the AQM-37, the sonic boom would be much less than that of an aircraft flying at a similar velocity and flight path. Sonic booms would not be heard outside of the VACAPES OPAREA. During the descent phase of the flight, the sonic boom would be directed downward towards the impact point and may startle marine wildlife along the flight path and near the impact location (Reference 5).

The target body would produce a momentary sound as it impacts with the ocean. Shock waves would propagate through the ocean and may be felt for some distance. Unless humans or animals are in the immediate vicinity of the impact area, noise would not be a problem. A discussion of marine mammals is located in Section 4.3.3 *Threatened and Endangered Species.* Impact areas would be cleared of personnel and the public prior to launch and no personnel or the public would be allowed in the impact area until the test is completed.

The noise generated by the AQM-37 activities at WFF would be within the limits of other current activities in the VACAPES OPAREA and the impact form noise would not be significant.

4.2.5 Hazardous Materials and Hazardous Waste

4.2.5.1 Hazardous Material and Hazardous Waste Management

The AQM-37 targets are shipped fully fueled, in sealed DOT-approved shipping containers, which have visual leak detectors (refer to Figures 4-1 and 4-2). Therefore, the final assembly and testing of the AQM-37 target at WFF is not expected to use or generate any hazardous material or waste.

Figure 4-1 AQM-37 Shipping Container

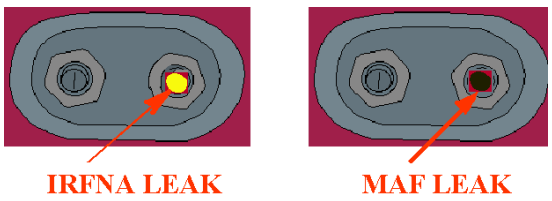


Figure 4-2 Leak Detectors on Shipping Container

Hazardous constituents of the AQM-37's hypergolic fuel include IRFNA as an oxidizer and MAF-4 as a fuel. Refer to Appendix A for MSDS's for both IRFNA and MAF-4. In addition, nitrogen gas is used to pressure fuels out of the tank and into the booster and sustainer chambers. The AQM-37 also contains oils, hydraulic fluids, and silver-zinc batteries.

If there are any unexpected requirements, hazardous materials would be ordered and managed through WFF's Safety Office.

These hazardous materials would be managed with standard procedures. Guiding principles include proper containment, separation of incompatible and reactive chemicals, worker warning and protection systems where necessary, and handling procedures to ensure safe operations. All personnel would receive extensive site specific Hazard Communication (HAZCOM) training before working in the area, and many would be required to receive the Hazardous Waste and Emergency Response (HAZWOPER) training.

WFF's ICP (Reference 11) would be modified to include emergency procedures for any spill associated with target receipt, storage, and transportation activities. Key elements that would be incorporated into the assembly, transportation, and disassembly operations include material compatibility, security, leak detection and monitoring, spill control, personnel training, and specific spill-prevention mechanisms. The existing hazardous materials handling capabilities at WFF would be adequate to ensure that all chemicals are handled safely and in accordance with applicable regulatory procedures.

Target receipt, storage, and transportation activities would not generate substantial quantities of hazardous waste. If any hazardous waste is generated, it would be properly managed. Operation requirements and personnel training requirements would be followed by all personnel.

4.2.5.2 Areas of Concern

Areas of Concern exist in the flight path of the aircraft to the VACAPES OPAREA. If an aircraft mishap occurs over these Areas of Concern, the Areas could be negatively impacted. However, the risk of mishap is extremely slight; therefore, there is an insignificant increase in the risk of impacts to Areas of Concern.

4.3 BIOLOGICAL ENVIRONMENT

4.3.1 Vegetation

All operations would occur either inside an existing facility, on a paved runway tarmac, or into the ocean. Moreover, no proposed or designated critical habitat, under the ESA, occur at WFF. Therefore, no impact to vegetation is anticipated.

4.3.2 Terrestrial Wildlife and Migratory Birds

Abundant wildlife populations in the Aircraft Operating Area (AOA) at WFF has resulted in several wildlife aircraft strikes and numerous wave-offs or aborted takeoffs and landings. The risk to aviation safety increases as the hazardous wildlife population within the AOA grows. The FAA maintains a "Zero Tolerance" policy for deer and birds on or around an active runway (References 23, 24, 25, 26, 27). Therefore, WFF hosts a representative of the Wildlife Services (WS) of the U. S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS), to assist in managing wildlife risks to aviation (References 23, 24, 25, 26, 27).

The WFF has implemented wildlife management practices in the AOA. Management practices have included the following (Reference 28):

- habitat modification, including spraying during the growth phase and controlled burning during the dormant phase of patches of *Phragmites australis* (common reed) within the stormwater outfalls drainage area where deer hide;
- fencing of the Main Base and the culverts under Route 175 to prevent wildlife from passing from U. S. Fish and Wildlife Service land onto WFF;
- harassment of wildlife with propane cannons, sirens, lights, and pyrotechnics;
- alteration of habitat by removal of food bearing trees and brush near runways;
- trapping and removal of foxes, feral cats, and birds;
- trapping and removal of resident Canada geese by WS APHIS representatives; and
- sharpshooting of deer by WS APHIS resentatives.

Therefore, since wildlife populations are actively discouraged in the AOA, no additional impacts to wildlife are anticipated.

4.3.3 Threatened and Endangered Species

No federal or state listed threatened, endangered, or rare plant or animal species are known to occur at WFF airport. Therefore, no impacts to these species are anticipated.

Threatened or endangered marine wildlife is addressed below.

4.3.4 Marine Mammals and Fish

On March 26, 2003, Ms. Carolyn Turner of EG&G, the environmental support contractor for WFF, spoke with Mr. Ken Hollingshead of NOAA's National Marine Fisheries Service's Office of Protected Resources. Mr. Hollingshead stated that the information in the WFF Memorandum for the Record dated July 5, 2000, *Taking of Marine Mammals Incidental to Rocket launches from NASA Goddard Space Flight Center's Wallops Flight Facility*, is still accurate. Mr. Hollingshead stated that "WFF is not required to submit an application for the incidental take of marine mammals since the level of impact from WFF activities does not warrant a Letter of Authorization" (Reference 29). Therefore, no significant impacts to marine mammals or other marine wildlife are anticipated.

No adverse effects on fish or essential fish habitats are anticipated since ocean currents would rapidly dilute any metal ions or other chemical constituents released by sunken targets (refer to Sections 4.2.1.3 *VACAPES OPAREA Substrate* and 4.2.2.1 *Surface Water* of this document). Similarly, no substantial indirect effects on fish species, as might occur via bioaccumulation of ionic metals from affected benthic organisms to higher species, are anticipated given that:

- the area of the sunken target or debris is small relative to the surrounding ocean ecosystem,
- currents continously disperse and dilute chemical constituents, and
- the number of benthic organisms that attach to the sunken target or debris would be insignificant compared to the mass in the surrounding ecosystem, efficiently minimizing any effects of this kind (Reference 8).

4.4 SOCIAL AND ECONOMIC ENVIRONMENT

4.4.1 Population

Impacts to population were considered to be of concern if development of the proposed project would cause overcrowding of schools or result in an increase of population that would stress existing housing availability. No permanent employees would be assigned to this operation; therefore, no increase in population for housing or schools is anticipated. Mission specific, temporary employees may be housed at either the WFF dormitories or in hotels, motels, or rental property in nearby communities.

4.4.2 Recreation

The WFF Public Affairs Office would meet with tournament organizers, fishing clubs, and Accomack County officials. The U. S. Coast Guard would issue a NOTMAR, through various public media, prior to AQM-37 launch operations. The NOTMAR would be posted at local docks and boat ramps from Ocean City, Maryland to Wachapreaque, Virgina. The AQM-37 operations would be scheduled around planned and future tournament dates to minimize any negative impacts to the tourist and recreation economy in the VACAPES OPAREA. Additionaly, the FAA would issue a NOTAM prior to AQM-37 launch operations and activate the special use airspace in the VACAPES OPAREA.

4.4.3 Employment and Income

No permanent employees would be assigned to WFF as part the AQM-37 operations; therefore, no increase or decrease in employee base would occur.

4.4.4 Health and Safety

Activities associated with the AQM-37 mission involve receipt, storage, and preparation of the targets at the M-Area; transportation of the target to the loading pad; and loading the target onto the aircraft. Each of these activities is discussed in the following paragraphs.

4.4.4.1 Transportation

The transportation of the target is subject to both federal and state regulations, including handling, labeling, and routing requirements. The AQM-37 is shipped overland in specially designed DOT-approved containers to protect the target in case of accident. The National Highway Traffic Safety Administration statistics show that the fatal accident rate for large trucks is one accident in every 59 million kilometers (37 million miles), making it a very rare occurrence (Reference 6). The likelihood of any impact on human health and safety from the transportation of targets to WFF is insignificant.

4.4.4.2 Storage

The bunkers are currently utilized to store explosives and ordinance. Bunker M-9 is rated for 36,000 kilograms (80,000 pounds) explosive weight within a 90 meter (300 foot) diameter hazard arc per both *NASA Safety Standard For Explosives, Propellants and Pyrotechnics* NSS-1740.12 (Reference 32) and the *Department of Defense Ammunition and Explosives Safety Standard* DOD-6055.9-STD (Reference 33). The NEW for each AQM-37 target is 13 kilograms (29 pounds). The use of these facilities would not change but would continue to be the same as before. Moreover, no other explovise device or

ordnance would be stored in this bunker along with the AQM-37 targets.

The interior of the bunkers is a half cylinder formed by 0.635 centimeter (0.25 inch) thick sheets of corrugated steel. The steel is covered with soil, in effect burying the bunker. Approximately 0.71 meters (28 inches) of soil and sod, cover the roof of the cylinder with a 9.1 meter (30.0 foot) slope forming a rectangular pyramid down the sides of the bunker. This structure is nearly impervious to external forces (i.e., fire, hurricanes, and lightning). Therefore, the targets inside the bunkers would not be impacted by external forces.

4.4.4.3 Target Preparation

All hazardous operations would be conducted in accordance with established standard operating procedures that are described in WFF's ICP (Reference 11). Activities during the assembly, transportation, loading, and disassembly of targets would be conducted in accordance with ground safety regulations and standard operating procedures that are already in place.

Safety procedures would be followed in case of accidental leakage or target-casing puncture resulting in leakage of either fuel or oxidant. Monitoring of the workplace would be required to detect and warn personnel of the presence of toxic vapors. Safety equipment and safety practices during normal operations and hazardous situations are the responsibility of the WFF Safety Office.

The analysis for the accidental release of toxic chemicals in this EA is based on the concentration of the toxic chemical as it is dispersed in the atmosphere. The toxic chemical would be transported by the prevailing winds to form a vapor cloud. There are two types of vapor clouds:

Plume: an elongated cloud whose leading edge travels with the wind while the trailing edge remains attached to the source of the vapors. This cloud exists when the source is still releasing chemicals to the atmosphere by evaporation of a liquid spill or direct release of a gas. While the cloud is attached to the source, it has the general shape of a tear drop.

Puff: an approximately spherical cloud where both the leading and trailing edges move together downwind. This cloud exists after the source has ceased releasing chemicals to the atmosphere.

The duration of the toxic cloud is the time from the initiation of the release to the time the maximum concentration level in the cloud falls below a toxic threshold limit. During the initial phase of the release, the cloud is of the plume type. But once the release is stopped, the chemical would evaporate, the cloud would detach from the release point, and move down the toxic corridor as a puff-type cloud (see Figure 4-3 below). After release, it initially assumes an oval shape, which gradually changes to a sphere as it diminishes in size until it is dispersed to below toxic threshold limits. The toxic corridor shown in Figure 4-3 is the length and maximum width of the toxic cloud. The length is measured from the source of the release to the furthest point reached by the leading edge of the cloud. Thus, personnel along the outer edges of the toxic corridor would not be exposed to concentrations above the toxic exposure limit, and personnel in the center of the

corridor would only be exposed for the time it takes the cloud to pass.

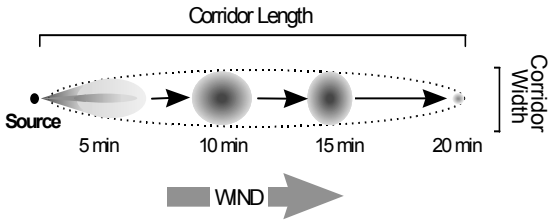


Figure 4-3 Toxic Cloud Lifespan

The extent of the toxic cloud from the accidental chemical release was calculated using toxic exposure limits defined by the American Conference of Governmental Industrial Hygienists and by the National Institute for Occupational Safety and Health. The Short Term Exposure Limits (STEL) are defined by the American Conference of Governmental Industrial Hygienists (Reference 30) as:

STEL: The concentration to which workers can be exposed continuously for a short period of time without suffering from 1) irritation, 2) chronic or irreversible tissue damage, or 3) narcosis of sufficient degree to increase the likelihood of accidental injury, impair self-rescue, or materially reduce work efficiency. A STEL is defined as a 15-minute, time-weighted average exposure which should not be exceeded at any time during a workday.

The Immediately Dangerous to Life or Health (IDLH) limit is defined by the National Institute for Occupational Safety and Health (Reference 9) as:

IDLH: A concentration that a worker can be exposed to for a 30-minute period without suffering injury or irreversible health effects in the event of respiratory protection equipment failure.

Recent amendments to 40 CFR 68, *Accidental Release Prevention Requirements: Risk Management Programs Under Clean Air Act Section 112(r)(7)*, June 20, 1996, defined the toxic endpoints for 77 toxic substances. The toxic endpoint is used to define the distance from the release beyond which environmental receptors would not be affected by the toxic substance. Note that the toxic endpoint concentrations are between the STEL and IDLH values. EPA acknowledges that very little, if any, data exists on the potential acute environmental impacts. Additionally, the consequence distances estimated using human acute-toxicity effects may not be directly relevant to environmental effects.

The STEL, IDLH, toxic endpoints, and the permissible toxic levels for each of the chemicals are shown in Table 4-4, below. The purpose of imposing the initial isolation and protective action zones is to minimize the hazard to personnel from toxic releases.

A toxic release model was generated by the WFF Safety Office using the Areal Locations of Hazardous Atmospheres (ALOHA) modeling software (Reference 31). Table 4-5 outlines the parameters to the model where Volume was calculated based upon the length and radius of the fuel or oxidizer tank and Stability Class “E” refers to ground level turbulence. When solar radiation is relatively weak, air near the surface has less of a tendency to rise and less turbulence develops. In this case, the atmosphere is considered "stable," or less turbulent, the wind is weak, and the stability class would be E or F.

Table 4-4 Toxic Concentration Values

Source of Toxicity Limit	Mixed Amine Fuel (MAF-4)		Inhibited Red Fuming Nitric Acid (IRFNA) CAS: 7697-37-2
	Unsymmetrical Dimethylhydrazine (UDMH) CAS: 57-14-7 (60% by weight)	Diethylene Triamine, Technical (DETA) CAS: 111-40-0 (40% by weight)	
Technical Manual, Navy Model AQM-37C, Change 1, 1991	10 min - 100 ppm 30 min - 50 ppm 60 min - 30 ppm 40 hrs/wk - 5 ppm		10 min - 30 ppm 30 min - 20 ppm 60 min - 10 ppm 40 hrs/wk - 0.5 ppm
Toxic Endpoints[1]	4.8 ppm	Not Listed	10 ppm
Threshold Limit Values[2]	STEL - Not Listed	STEL - Not Listed	STEL - 4 ppm
Recommended Exposure Limits[3]	IDLH - 15 ppm	IDLH - Not Determined	IDLH - 25 ppm

[1] 40 CFR Part 68, Appendix A, Table of Toxic Endpoints
[2] Reference 30
[3] Reference 9

Table 4-5 ALOHA Model Parameters

Parameter	IRFNA	MAF-4
Concentration	2 ppm	0.5 ppm
Volume	109 pounds / 49 kilograms	9.39 pounds / 4.26 kilograms
Wind speed	10 mph / 16 kph	10 mph / 16 kph
Rel. humidity	5 %	5 %
Temperature	85° F / 29° C	85° F / 29° C
Cloud cover	None	None
Stability class	"E"	"E"
Time of day	Night	night

Using the above parameters, the ALOHA model predicted the following isolation zones and protective distances:

- IRFNA
  - Initial isolation zone of 90 meters (300 feet)
  - Daytime downwind (protected distance) of 230 meters (750 feet)
  - Nighttime downwind (protected distance) of 550 meters (1,800 feet)
- MAF-4
  - Initial isolation zone of 60 meters (200 feet)
  - Daytime downwind (protected distance) of 230 meters (750 feet)
  - Nighttime downwind (protected) distance of 410 meters (1,350 feet).

Figure 4-4 depicts an initial isolation zone and protective action zones.

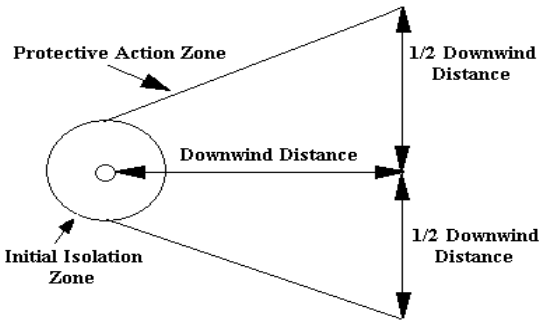


Figure 4-4 Initial Isolation and Protective Action Zones

4.4.5 Cultural Resources

Within the Area of Potention Effects, WFF is not part of an historical district. The only structures that would be utilized for the AQM-37 operations are those in the M-Area. Final assembly and disassembly would occur in a building constructed in 1963 and not of sufficient historical importance to be eligible for listing on the National Register of Historic Places as a property less than 50 years old. However, the bunkers for storing the targets were constructed 1945. Although, the bunkers are greater than 50 years old, there will be no potential to effect these structures. The bunkers are currently utilized to store explosives and ordinance. Bunker M-9 is rated for 36,000 kilograms (80,000 pounds) explosive weight within a 90 meter (300 foot) diameter hazard arc per both *NASA Safety Standard For Explosives, Propellants and Pyrotechnics* NSS-1740.12 (Reference 32) and the *Department of Defense Ammunition and Explosives Safety Standard* DOD-6055.9-STD (Reference 33). The NEW for each AQM-37 target is 13 kilograms (29 pounds). The use of these facilities would not change but would continue to be the same as before. Moreover, no other explovise device or ordnance would be stored in this bunker along with the AQM-37 targets. No other historic properties within the Area of Potential Effects would be adversely impacted. Therefore, WFF anticipates no negative potential to effect cultural or historical resources.

Should any unforeseen cultural or historical resources be encountered, activity would be suspended until the Historic Preservation Office is notified and consulted. Environmental consequences for undisturbed cultural or historical resources would be minimal.

4.4.6 Environmental Justice

No low-income or minority communities occur along the borders of WFF, therefore no Environmental Justice impacts are anticipated. No nursing homes, hospitals, or schools are located in close proximity to WFF. One public campground, Trail's End, is located approximately 1.48 kilometers (0.92 miles) northeast of the M-Area. One day care center, Three Bears is located approximately 2.51 kilometers (1.56 miles) south-southwest of the M-Area. Neither of these facilities would be in the planned flight path of the aircraft and both are well beyond the explosive/hazard zone of the M-Area. Therefore, no disproportionate risks to children that result from environmental health risks or safety risks are anticipated.

4.4.7 Infrastructure and Transportation

Existing facilities and infrastructure at WFF would be used to control the AQM-37 targets. Personnel presently employed at WFF would be used for launch range operations and support. The impact to the infrastructure and transportation systems in the WFF area would be minimal and in accordance with DOT regulations.

4.5 CUMULATIVE EFFECTS

Each target launch is independent of another. Additionally, no more than 1 to 30 launches are anticipated per year in a vast area of the VACAPES OPAREA. Hazardous constituents of concern for the AQM-37 include fuels, metal ions, lubricating oils, hydraulic fluid, and silver-zinc batteries. However, IRFNA (the

oxidizer) and MAF-4 (the fuel) would completely decompose in the presence of water. Toxic concentrations of metal ions would not be produced because the corrosion rates are slow in comparison to the mixing and dilution rates associated with marine environments. Battery electrolytes and hydraulic fluids are in such small quantities that only temporary effects would be expected. Therefore, no significant cumulative effects are anticipated from the proposed action.

Aircraft operations at the WFF airport are very similar in nature to existing operations performed daily. No additional permanent personnel would be required to support AQM-37 activities. The increase of a maximum of 30 missions per year represent a small increase to the overall missions that are flown each year from the WFF airport. Aircraft operations for the AQM-37 target program would not cause a significant increase to the cumulative effect on the environment at WFF.

4.6 OTHER NEPA DISCLOSURES

4.6.1 Unavoidable Adverse Effects

Adverse environmental effects that cannot be avoided include the release of small amounts of pollutants into the atmosphere and into the Atlantic Ocean; slight increase of the risk to public safety from an accidental release of chemicals; and minor noise impacts. However, these adverse environmental effects would not be at significant levels.

4.6.2 Relationship of Short-Term Uses of the Human Environment and the Maintenance of Long-Term Productivity

All activities at the proposed locations would take advantage of existing facilities and infrastructure. Therefore, the proposed action would not be expected to result in any impacts that would reduce environmental productivity, permanently narrow the range of beneficial uses of the environment, or pose long-term risks to health, safety, the sustainability of the local community or the environment.

4.6.3 Irreversible and Irretrievable Commitment of Resources

The amount of materials and energy required for the proposed activities would be small and is similar to activities that have been carried out in previous years at the WFF.

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APPENDIX A

Material Safety Data Sheets